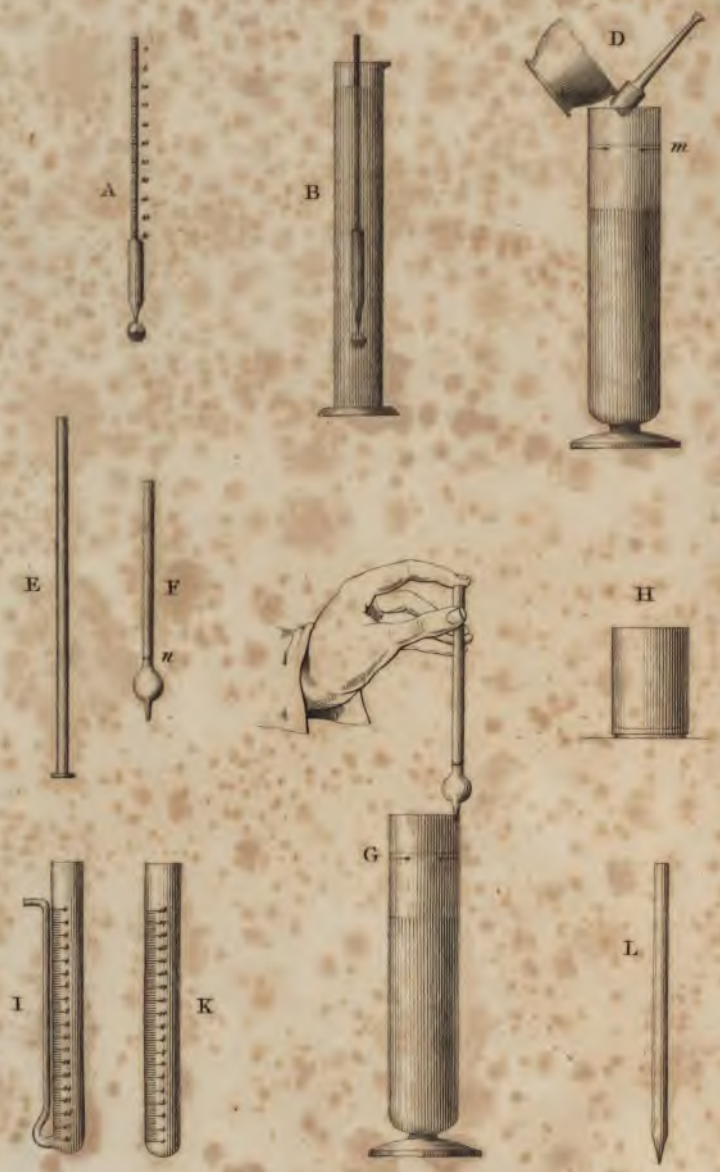
CHLOROMETER, &c.



Engraved for Alcock's Essay on the Chlorurets of Lime and of Soda.

✓ J. H. 1828

AN ESSAY

ON THE USE OF

CHLORURETS

OF

OXIDE OF SODIUM AND OF LIME,

AS POWERFUL

Disinfecting Agents,

AND OF THE

CHLORURET OF OXIDE OF SODIUM,

MORE ESPECIALLY

AS A REMEDY OF CONSIDERABLE EFFICACY,

IN THE TREATMENT OF

HOSPITAL GANGRENE; PHAGEDENIC, SYPHILITIC, AND ILL CONDITIONED ULCERS; MORTIFICATION;

AND VARIOUS OTHER DISEASES.

DEDICATED BY PERMISSION TO

THE RIGHT HONOURABLE ROBERT PEEL.

BY THOMAS ALCOCK,

Member of the Royal College of Surgeons in London; Member of the Medical and Chirurgical Society, &c. &c.

"*Nisi utile est quod facimus stulta est Gloria.*" PHŒDRUS.

LONDON:

PUBLISHED BY BURGESS AND HILL,

55, GREAT WINDMILL STREET, HAYMARKET,

And Sold by all other Booksellers.

1827.

357

CONTENTS.

INTRODUCTION.

Before entering upon the consideration of the uses of the chlorurets of oxide of sodium and of lime in medicine, the author deems it simply an act of justic to state, that it is to M. Labarraque, a distinguished philanthropist at Paris, to whom humanity and science are indebted for the introduction of these valuable additions into the healing art.

In the subsequent pages he has freely availed himself of the publications of M. Labarraque, and of various other scientific works published in France, which contain details respecting the use of these remedies.

The author begs leave to express his acknowledgements to M. Labarraque, for the liberality with which he afforded personal information on points which did not appear sufficiently developed in his published works: and also to M. Lisfranc, chief surgeon of La Pitié, whose zeal for the improvement of surgery is known and appreciated both in France and in this country, for his great politeness in pointing out many interesting cases under his treatment by these remedies, and permitting daily observation to be made of their progress, as well as for his great candour in affording every information solicited respecting them. His acknowledgments are also due to Sir Anthony Carlisle and Mr. White, surgeons, and to Dr. G. H. Roe, Physician, to the Westminster Hospital, for the obliging readiness with which

they have permitted the beneficial effects of the chlorurets to be demonstrated in cases under their care.

Although many valuable uses may be made of these agents in the arts, which may be pointed out on a future occasion, it may be observed that it is not intended in the present work to enter into the details of the employment of these disinfectants in the manufactures of animal substances; although this use of them led to their extension to the healing art, M. Labarraque having been induced, by a reward offered by the Society for the Encouragement of National Industry, to turn his attention to the means of destroying the infectious odour, and preventing putrefaction in the materials used for the manufacture of catgut and other strings made from the intestines of animals.

The nomenclature adopted by M. Labarraque has been retained; the term chloruret having been the designation used, as the English translation of the French *chlorure*, in the short notices of these remedies which have appeared in various English periodical works, and for other reasons stated below; and as the mode of preparation is detailed in a subsequent part of this work, no ambiguity need exist, whatever modification the names may undergo.

The CHLORURET OF THE OXIDE OF SODIUM may also be designated by the terms,

Chloruret of soda:

Chloride of soda:

It may be proper to observe that the mode of preparation and the peculiar properties of this article, as prepared by M. Labarraque, are not described in any English works on Chemistry with which the author is acquainted.

The CHLORURET OF LIME, formerly called the oxymuriate of lime, has also been termed the *chloride* in this country.

The dry preparation is a *sub-chloruret of hydrated lime*, the *chloruret* being formed only in the solution of the subchloruret

in water, (see page 139.) The process recommended by M. Labarraque for the manufacture of this preparation differs from that generally adopted in the arts. Various terms have been used to designate the sub-chloruret or sub-chloride of lime, as extensively used in the arts in this country; the most common appellation is that of *bleaching powder.*

Both the French and English Chemists employ the terms chlorate and chloruret (chlorure) to denote different combinations of chlorine.

The term *chloride* is used as synonimous with *chloruret.*

CHLORATES. The name of *chlorates* is given to those salts which result from the combination of *chloric acid* with salifiable bases.

CHLORURETS. Chlorine is susceptible of combining with almost all the simple substances and with some compound bodies; these are the combinations which are termed *chlorurets:* many kinds are known, but there are few which are useful in the arts. The chlorurets are classed under two principal heads under the denominations of *metallic chlorurets* and of *chlorurets of oxides;* that is to say, that the former result from the combination of chlorine with the metals themselves, and the latter from the combination of chlorine with their oxides. It is to be remarked that there are only a few oxides very difficultly reducible which are in this case; such are those of potassium, sodium, barium, calcium, &c. What especially distinguishes the chlorurets of oxides from the others, is, that they retain several of the properties of chlorine, and particularly that of destroying vegetable colouring substances; hence they are much employed for this purpose in the arts.

Although the term *chloride* is synonimous with that of *chloruret*, (*chlorure*, French) yet it is more liable to be confounded with the term *chlorate*, which, as has been already shewn, appertains to a class of salts different in their chemical composition, and not possessing either the bleaching, disinfecting, or the medicinal properties which belong to the chlorurets. (See also page 138.)

The term *chloruret of oxide of sodium* has also been retained in preference to that of *chloruret of soda*, to prevent mistake by confounding the chloruret of soda with the chloruret of *sodium*, which, like the chlorates, does not possess the same valuable properties as the *chloruret of the oxide of sodium*. The *chloruret or chloride of sodium* is the residuum of common salt, after it has been exposed to a heat approaching to redness.

In the year 1819, the Society for the Encouragement of National Industry, in France, declared as a subject for competition, (according to the desire of the Prefect of Police, charged with the salubrity of the capital) the rendering healthy the art of the catgut maker, (L'assainissement de l'art du Boyaudier;) this question was proposed in the following terms: "*To find a chemical or mechanical process to remove the mucous membranes of the intestines used in the manufacture of gut-strings without employing maceration, and to prevent putrefaction. To describe the manner of preparing intestines by insufflation:*" adding, that some partial trials had already led to the hope that the successive and skilful use of alkaline lixivia and acid baths might afford the solution of the problem, &c.

After many experiments M. Labarraque conceived that he had succeeded in resolving the problem: he caused the Council of Health to be informed of it, which deputed one of its members to witness the experiments of M. Labarraque in a manufactory. They were satisfactory. The Report of the Council of Health, printed in 1820, alludes to it in designating an apothecary in Paris, who, says the Report, has *succeeded in destroying all the putrescency (fetidité) in the workshops for the manufacture of catgut.*

M. Labarraque was induced to promise to compete for the prize proposed by the Society of Encouragement; he had renounced this intention when the only member of the Council who had witnessed his experiments happened to

die: M. Labarraque believed he should only fulfil a religious duty in keeping his word to one who was no more. Stimulated by this conviction he set himself to work, multiplied his experiments and remodelled the art of the catgut maker. His memoir was rewarded the 30th October, 1822, after having remained six months in the hands of the commissaries, who could not find out the disinfecting process of M. Labarraque, until after having witnessed its effects on *more than a thousand ox intestines in full putrefaction.* The details of this interesting experiment will be found in a subsequent part of this work. The prize of 1,500 francs was adjudged to M. Labarraque.

The following extract from the *Procès-verbal* of the Society at its general meeting, held the 30th October, 1822, is conclusive respecting the claim of M. Labarraque.

" 1st. Considering that the first and principal question, that proposed by the Counsellor of State, Prefect of Police, and for which the prize was founded, is completely resolved by M. Labarraque, author of the Memoir, No. 1, the Commission proposes that you should adjudge to him the entire prize, imposing upon him, however, one condition, to which he will very willingly submit; it is that of drawing up an account of his procedure, to reduce it to the comprehension of every one, and to follow with zeal the execution of it in the different manufactories. This measure, if we would profit by the discovery of M. Labarraque, appears to us to be indispensable."

This Commission was composed of

M M. le compte BERTHOLLET, membre de l'Académie des Sciences;

BREANT, vérificateur des essais à la Monnaie;

DARCET, membre de l'Académie des Sciences;

DARTIGUES, membre du Conseil général des Manufactures;

MM. DESPRETZ, professeur de Chimie à l'Ecole polytechnique;
MÉRIMEE, secretaire perpetuel à l'Ecole des Beaux Arts;
PELLETIER, professeur à l'Ecole de Pharmacie;
ROARD, membre du Bureau consultatif des Arts et Manufactures;
THENARD, membre de l'Académie des Sciences;
VAUQUELIN, membre de l'Académie des Sciences;
PAYEN, Manufacturier;
et le professeur ROBIQUET, *Rapporteur*.

The disinfection of corpses was proposed by M. Labarraque to be effected by means of the chlorurets of oxide of sodium or of lime. The Council of Health adopted the proceeding, and the Prefect of Police gave orders to that effect. The expence for the conservation of all the dead bodies deposited at the Morgue of Paris, during one year, did not amount to *one hundred and fifty francs*, (six pounds sterling) a circumstance honorable to M. Labarraque's disinterestedness, since he was intrusted with the furnishing of the chlorurets for this purpose.

In October, 1823, the Prefect of Police issued the following order.

PREFECTURE OF POLICE.

Paris, 19th October, 1823.

"WE, Counsellor of State, Prefect of Police, having examined the Report of the Council of Health, from which it appears that numerous experiments, made successively in various localities, and particularly at the Morgue, have demonstrated the efficacy of the use of the chloruret of lime as a mode of disinfection, according to the procedure of M. Labarraque, Apothecary at Paris, Rue Saint Martin,

Have decreed as follows:

FIRST ARTICLE.

"There shall be established disinfecting apparatus of the invention of M. Labarraque, at the Morgue, and at the residence of each of the Commissaries of Police, herein designated," &c. &c.

M. Labarraque made experiments upon living beings, and guided by the action of the chlorurets on dead substances, he proposed the use of them upon man in all cases of disorganization. He followed up experiments in the Hospitals, and during eight months he furnished gratuitously to the Hospitals of Paris his chlorurets, and also to all men of science in the profession who were desirous of making experiments.

In 1823, M. Labarraque proposed to the government his views for rendering healthy lazarettos, for the purification of merchandize, of baggage, of the sailors and passengers of ships, &c. He shewed the possibility *of rendering the propagation of contagious or infectious diseases impossible.*

The views of M. Labarraque were maturely examined by several learned men, who called M. Labarraque to long conferences. A favourable report was made at the end of a year, and M. de Boisbertrand, Director-general of the Establishments of Public Utility of the Kingdom, sent the sanitary views of M. Labarraque to the Lazaretto of Marseilles: see the Report inserted in the Guide Sanitaire.

The works of M. Labarraque having excited attention, the Royal Institute of France decreed to the author *of the discovery of the disinfecting properties of the chlorurets,* a prize of three thousand francs, which he received at the solemn sitting of that learned assembly, the 20th of June, 1825, amidst the acclamations of an enlightened and numerous public. M. Labarraque did not think of presenting himself to the concourse, not believing that he had yet done enough, since he continued his experiments without intermission.

ROYAL INSTITUTE OF FRANCE.

Royal Academy of Sciences.

Extract from the Programma of the Prizes, decreed in the public sitting of Monday, 20th June, 1825.

Prize founded by the Will of Baron de Montyon.

"There is granted to M. Labarraque, Apothecary, in Paris, a prize of *three thousand francs* for having shewn by a great number of experiments that we may employ with success, economy, and facility, the solutions of the chlorurets of lime and of soda, dissolved in water, to destroy immediately the infectious odours arising from the animal substances employed in the art of making catgut, and those of corpses in putrefaction, also to purify places where the air is corrupted."

The disinfection of dead bodies has been proved many times, after inhumations of several days, of several weeks, and of several months, and always with the same success. The corpse of Louis XVIII was presented to the public *without any odour*, the disinfecting chloruret of M. Labarraque having been used. M. L. was present at the embalming of the body of the late king.

The only recompence which the French Government has granted to M. Labarraque is that of the minister of the interior, who subscribed for two hundred copies of M. Labarraque's last pamphlet, which sells at one franc. The Director General of the establishments of public utility, in causing M. Labarraque's pamphlet to be transmitted to all the prefects, sent with it a circular having for its object to shew the advantages which may be derived from the use of the chlorurets. M. Labarraque has considered himself sufficiently recompensed by the kind reception which this

worthy functionary has never ceased to accord every time that he has required the attendance of M. Labarraque on objects of public utility.

The following passages are translated from the circular which M. Labarraque refers and a copy of the original is subjoined.

"The procedure of M. Labarraque presents incontestable advantages beyond the employment of gazeous chlorine, and beyond all the disinfectants which have been recommended to this day. The author of this process has made the most numerous and varied applications, and the success which he has obtained has merited honourable commendation.

"The memoir which I transmit you indicates some of the cases in which the chlorurets of lime and of oxide of sodium have been used with the greatest success to destroy insalubrious exhalations, and to remedy the accidents of which they are the cause. From hence it is easy to deduce the disinfecting properties with which these substances are endowed, and experience proves in effect that we may usefully employ the Chlorurets in question in lazarettos, in hospitals, in prisons, in depots of mendicity, in dissecting rooms, in numerous workshops, and particularly in those in which operations on animal substances are carried on; that we may employ them with advantage to disinfect places inhabited by persons labouring under small pox, and to attenuate the effects of epidemics, of contagions, of epizooties.* It is proper more especially, to make use of them when we are under the necessity of disinterring corpses by order of the judiciary authority, when diverse circumstances render it requisite to retard the interment, or accelerate the developement of putrefaction; in fine they are efficacious remedies in certain cases of asphyxia."

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* (Diseases of Cattle.)

" MINISTÈRE
DE L'INTÉRIEUR.

ADMINISTRATION
GÉNÉRALE
des
ÉTABLISSEMENS
D'UTILITÉ PUBLIQUE
et des
SECOURS GÉNÉRAUX

2e. BUREAU

CIRCULAIRE
N°. 53.

Paris, le 17 Octobre 1825.

MONSIEUR LE PRÉFET, j'ai l'honneur de vous transmettre exemplaires d'un ouvrage publié par M. Labarraque, pharmacien à Paris, sur les propriétés des chlorures de chaux et d'oxide de sodium, considérés comme moyens de désinfection.

Le procédé de M. Labarraque présente des avantages incontestables sur l'emploi du chlore gazeux, et sur tous les autres désinfectans qui ont été recommandés jusqu' à ce jour. L'auteur de ce procédé en a fait les applications les plus nombreus et les plus variées, et les succès qu'il a obtenus lui ont mérité d'honorables suffrages.

Le mémoire que je vous transmets indique quelques uns des cas où l'on s'est servi avec le plus grand succès des chlorures de chaux et d'oxide de sodium pour détruire des exhalaisons insalubres, et pour remedier aux accidens dont elles sont la cause. De là il est facile de déduire les propriétés désinfectantes dont ces substances sont douées, et l'experience prouve en effet qu'on peut se servir utilement des chlorures dont il s'agit dans les lazarets, dans les hospices, dans les prisons, dans les dépôts de mendicité, dans les salles de dissection, dans les ateliers nombreux, et particulièrement dans ceux où l'on opère sur des matières animales ; qu'on peut encore les employer avec avantage pour désinfecter les lieux habités par des varioleux, et pour atténuer les effets des épidémies, des contagions des épizooties. Il convient sur-tout d'en faire usage quand on est dans la nécessité d' exhumer des cadavres par ordre de l'autorité judiciaire, quand diverses circonstances obligent de retarder les inhumations ou accélèrent le développement de la putréfaction ; c'est en fin un remède efficace dans certaines asphyxies.

D' après toutes ces considérations, je crois devoir appeler votre attention sur le procédé de M. Labarraque et sur les moyens à prendre pour en répandre la connaissance dans votre département. Je

vous invite à en recommander l'emploi dans les hôpitaux, dans les pri sons, dans les autres établissemens publics ou particuliers, et dans les differens cas où il peut recevoir une utile application. A cet effet, indépendamment des instructions que vous addresserez aux fonctionnaries ou aux administrations placés sous votre autorité, vous pouvez faire publier, sous forme d'affiches un extrait du mémoire de M. Labarraque, indiquant succinctement les propriétés désinfactantes des chlorures et la manière d'employer ces substances.

Les exemplaires que je vous transmets doivent etre répartis entre les divers chefs-lieux d'arrondissement et les administrations sanitaires de votre département.

Agréez, Monsieur le Préfet l'assurance de
ma considération la plus distinguée.

Pour le Ministre:

Le Directeur,

A M. le Préfet d

Signé de Boisbertrand."

The result of M. Labarraque's views respecting the Lazaretto of Marseilles will be found in a subsequent part of this work.

On the 18th of May, 1826, the Secretary of the Academic Society of Marseilles announced to M. Labarraque that the Society had awarded him a medal for the important discovery of the medical uses of the chlorurets. The letter adds that such other brilliant and flattering rewards had been conferred on Mr. L. that the Society scarcely dared to offer the tribute of their gratitude.

M. Labarraque's modesty and disinterestedness are as honourable to him as his brilliant discoveries of the useful applications of the chlorurets: the author takes the liberty of subjoining an illustration.

" Mr. Labarraque n'a sollicité aucune récompence; il a reçu des témoignages flatteuses de l'intérêt que ses travaux

inspirent aux amis de l'humanité de tous les pays; Mr. Labarraque a la douce satisfaction d'être utile aux hommes; son ambition est ——— satisfaite."

The useful and honourable labours of M. Labarraque have received a further confirmation by an act of Royal favour, the King of France having, on the 31st October, presented M. Labarraque with the cross and the title of Chevalier of the Legion of Honour.

The testimony of Dr. Robert, physician to the Lazaretto at Marseilles, is so honourable to Mr. Labarraque, and so creditable to the judgment and good feelings of Dr. Robert that no apology can be required for placing it before the reader. Dr. R. alluding to an historical outline of the Lazaretto of Marseilles, and of the contagious diseases which have been introduced therein since the epoch of its foundation in 1383, observes:

"It was under the empire of these various disinfecting processes that the public health and practical medicine existed during so many centuries, depending sometimes upon real success, at others on results completely null; when a new benefactor to humanity, without other motive than regard for the public good, came, by the aid of a simple chemical combination, but much more powerful than those formerly in use, to associate himself modestly with the glory of his illustrious predecessors. By making known to the public the valuable uses of the chlorurets of oxide of sodium and of lime, respecting the preservation and restoration of health, M. Labarraque has eclipsed the fame of the celebrated Jenner, since the discovery of the latter is only most generally useful to infancy, whilst the French chemist has laboured for all ages and has especially indicated the means of preserving the crowded population of our large manufacturing towns, the most frequently exposed to so many causes of infection."*

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* *Guide Sanitaire des Gouvernemens Européens, &c.* Par L. J. M. ROBERT, &c. Paris, 1826. p. 777.

The extensive usefulness of these means having been so fully ascertained in France, under the observation of men distinguished by their scientific attainments, may supersede in a great measure a detailed series of experiments.

Should however the distinguished statesman and philanthropist whose condescension has permitted these pages to appear under the sanction of his high name, be of opinion that it may be useful to humanity still further to establish the facts by a series of experiments made in this country, the author of this essay will consider himself further honoured in being permitted to conduct a series of demonstrative experiments, which may be perfectly conclusive as to the extraordinary power of these agents, under the observation of any person or persons who may be appointed to witness them.

The author of this little work has endeavoured to collect the scattered information relating to this subject, and to add such further observations as his personal observation and experience have afforded; and thereby to render these remedies available to his countrymen and others, an object which he considers of great importance to humanity.

This object he conceives may be effected by shewing the value of these agents as disinfectants and in the prevention of disease; the diseases in the treatment of which they may be beneficially employed as remedies; the precautions to be observed in their application to the living body; and lastly their mode of preparation, and the tests by which their fitness may be ascertained.

How far he may or may not have succeeded in this endeavour he leaves to the candid reader to determine: he has sought rather to prove useful than to seem learned; and whatever opinion may be formed of the merits or demerits of the work, should a single life be preserved, by the means pointed out, in those diseases which have hitherto been too often fatal, and in the treatment of which the highest skill

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my professional brethren to suppose them unacquainted with the baneful influence of a contaminated atmosphere in the production of disease; or of the imperative necessity for the correction of such a condition as essential to the restoration of patients already labouring under disease.

On the Prevention of Putrefaction in Corpses previously to Interment.

One of the frequent causes of infectious or pestilential emanations may be found in the putrefaction which often takes place in corpses, previously to the period which custom has sanctioned for interment. The feelings or convenience of friends, who sometimes travel great distances to pay the last tribute of respect to a deceased relative, renders it desirable that the usual period should not be encroached upon, whilst the safety of those around requires that they should be protected from noxious effluvia. This becomes the more imperative in the humbler classes of society, whose affections, as well as those in higher stations, ought to be respected, since their limited means not unfrequently preclude the opportunity of removing the corpse to a vacant apartment.

Of the prevention of putrefaction the practice which has been adopted at the Morgue at Paris, by order of the authorities, affords sufficient proof. To this place all dead bodies found in the Seine, in

Paris or its environs, are deposited for inspection, that they may be claimed or identified previously to interment. Even when bodies have been far advanced in putrefaction, the affusion of a solution of chloruret of lime in water has immediately removed the putrid odour. The superintendant has uniformly remarked that bodies washed in this manner remain fresh much longer than others.

M. Idt, a distinguished apothecary at Lyons, wrote to M. Labarraque from that place, dated 4th August 1825:—"During the whole month of July the thermometer was constantly at 34 degrees,* and the corpses a few hours after death spread an odour so infectious, that during the mass which was celebrated for the repose of their souls, the priests and the friends forgot,—the former the resignation of their ministry, the latter their affliction,—to complain, and to close their nostrils. The surgeon major of the great Hôtel Dieu, *M. Gesnoul,* reasonably fearing lest emanations so mephitic should occasion an epidemic disease, proposed to the mayor to cause a glassful of your solution to be thrown upon the sheet by the commissary of police, at the moment he opened the coffin to ascertain the presence of the corpse. The mayor immediately adopted the proposition of the young doctor; and the result has been most

* By what thermometer is not stated: 34 degrees of the Centigrade are equal to 93° F., and 34° Reaumur are equal to 108½° F.

satisfactory: thus the *Journal du Commerce de Lyon*, in relating this fact, has expressed the desire to see a process so simple and useful generally adopted, &c."

To undertakers, searchers, and those persons employed to place the corpses in their coffins, to adjust the shroud, and other customary details, these disinfectants will prove a valuable safeguard against infection; and a still greater comfort to the friends, less accustomed to the disagreeable odours emanating from dead bodies, which by these means may be prevented.

The mode of employing the chloruret of lime to prevent or retard putrefaction is very simple, and may be effected at a trifling expense.

To one part of chloruret of lime add forty parts of water: mix them thoroughly, and pour off the clear liquid.

With this liquid the entire surface of the body should be freely sprinkled by means of a watering-pot, or in any other convenient manner. This sprinkling should be repeated twice or oftener, daily, according to the temperature, degree of putrefaction, &c.

Should putrefaction be far advanced, or the period the corpse is intended to be kept be considerable, it is better to surround the body with a sheet moistened in the solution, and to renew the moistening of it frequently. By these means all putrefactive odour in the apartment may be perfectly obviated.

Another important occasion on which the chlorurets may be applied, is when the body of any distinguished or illustrious personage may be required to lie in state. The remains of the late Lord Byron, though eagerly visited, were in a great measure deprived of the interest which might have been anticipated, by being soldered up in a leaden coffin: whilst those of Louis XVIII. were freely approached by his people; and this without any disagreeable odour, many persons expressing their astonishment at this circumstance. I have it from very good authority that this surprising freedom from putrescency was the result of the proper application of the chlorurets, under the direction of M. Labarraque.

On the Disinterment and Examination of a Corpse for the Purposes of Judical Inquiry.

Another purpose for which either of the chlorurets may be beneficially employed, is that of enabling the examination of a dead body to be made to promote the ends of justice; when without such disinfecting means the degree of putrefaction might render the examination unsafe or impracticable.

M. Labarraque had foreseen the importance of this process, and had recommended the indispensable use of the chlorurets in examining the body of a person interred for some weeks: and the practicability and safety of such an undertaking

were fully verified by Professor Orfila, on a corpse which had been buried thirty-two days, and in the hottest season of the year.

The following is a translation of the authorised statement of this remarkable case.

"Report of an examination of a dead body, made at the request of the Attorney of the King, the 1st August 1823, by Messrs. ORFILA, HENNELLE, GERDY, and LESUEUR. Drawn up by M. HENNELLE.

"The 1st August 1823, at the request of the King's Attorney, professor *Orfila* and Messrs. *Lesueur, Gerdy,* and myself, met at the cemetary of Père-Lachaise, there to make the examination of the body of the said B***, who died a month since. At half-past seven in the morning the exhumation of the corpse was proceeded with: it exhaled an infectious odour; it remained till half-past ten o'clock upon the ground and out of its coffin, the persons who were to prove its identity not having yet arrived. The temperature was from 17 to 18 degrees of the centrigrade thermometer (= about 63° or 64° Fahr.) Then the body was carried to a large and well aired place, that the examination might be made as conveniently and salubriously as possible. The odour became still more insupportable; the corpse had become swollen in a very manifest degree since it was taken out of the ground; it would therefore be important in a similar case, to make the examination as

speedily as possible. We began by making aspersions upon the subject with chloruret of lime dissolved in water: this liquor, which had been proposed by M. Labarraque, apothecary (See the 1st volume of the *Archives*), produced a marvellous effect; for scarcely had a few aspersions been made, before the infected odour was instantaneously destroyed, and it became possible to begin the operation." (Extract from the 2nd volume of the *Archives générales de Médecine*, p. 581, August 1823.)

It is not necessary to follow the very minute and full details of appearances which each part of the body presented: suffice it to say, that the presence of white oxide of arsenic within the intestines was incontestably proved, the analysis being made at the *Ecole de Médecine*, the gentlemen who had examined the body having there the assistance of Professor *Chaussier* and *M. Baruel*. The principal part of the arsenic was found in the large intestines; and it is a remarkable fact that the parts which contained the most of this white powder also contained the greatest quantity of yellow mucosites.

The name of the individual whose body was the subject of this examination (though suppressed by M. Labarraque) was *Bourcier*.*

* For the following very interesting recollections I am obliged to Dr. Filkin, Charlotte-street, Bedford-square, who at the time alluded to was residing in Paris:—

This remarkable examination, performed by men of science and high reputation, fully esta-

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"Bourcier was a married man, and had lived very happily with his wife until within a short time before his death, when he was much annoyed by the very frequent visits of a Greek who was very constantly in the shop with his (B.'s) wife. This was the source of many quarrels between B. and his spouse. About the end of June 1823, Bourcier was attacked with symptoms of acute inflammation of the stomach, a disease so common at that time in Paris, that the medical attendant never thought of attributing these symptoms to poison. The disease proved fatal, and his medical attendant as well as the physician of the quarter must have certified that there was no reason to suppose that the deceased had come by his death from unfair means. On the very day of her husband's death (as was subsequently proved) and on the day of his interment, Bourcier's widow was seen at balls with her Greek lover, and very frequently immediately afterwards. This led the neighbours (who were aware of the quarrels between Bourcier and his wife as well as the cause of them) to suspect that some unfair means had been used to get rid of him. These suspicions found their way to the Police, who ordered the widow and her paramour to be arrested, and the body to be disinterred and examined. The Greek escaped. The widow was afterwards brought to trial; and though the presumptive evidence against her was very strong, yet as there was no proof that she had administered the arsenic, she was acquitted"

Dr. Filkin adds:—"On the preceding pages [of his note] you have the circumstances which I promised concerning Bourcier. They are drawn out from memory as I stated them to you the other day in conversation; but I have since ascertained that the widow was acquitted, as mentioned at the close of my account. Previous to my obtaining this piece of information I had recollected that the paramour was a Greek, and I think also a *courier*, but am not so clear upon this point as the rest."

blishes the great power of the chloruret as a disinfecting agent, and further shows that retributive justice may overtake the murderer at a period when, without the resources of art and science, proof would be impossible.

The instructions of M. Labarraque respecting the mode of using the chloruret of lime, recite, that repeated experiments have shown that the chloruret of lime dissolved in water has the property of disinfecting the air, and of sensibly retarding putrefaction; they comprise the following directions.

"Before approaching a corpse in putrefaction, a tub should be procured in which may be put a load of water (24 litres, about 49 pints); pour into this a flagon (half a kilogramme=1 lb. 1 oz. 10½ dr. avoirdupois) of the chloruret of lime, and stir the mixture.

"Dip a sheet in the water contained in the tub, and unfold it so as to be able to withdraw it with facility, and particularly so as to be enabled to extend it very quickly over the corpse.

"To effect this, let two persons open the sheet and place it in the liquid, holding the ends upon the edges of the tub: let this be carried to the side of the body in putrefaction, and at the same instant let the wet sheet be drawn out of the tub and laid over the body.

"Soon afterwards the putrid odour ceases.

"If blood or any other fluid proceeding from

the dead body have flowed upon the ground, pour upon this liquid one or two glaassfuls of the chlorureted water; stir with a broom,—and the putrid odour will disappear.

"This operation, however, ought not to be thus performed whenever the liquids spilled upon the ground may become the subject of a chemical analysis: in this case the greatest quantity possible should be carefully collected; and it is when this has been effected that the disinfection of the ground should be performed in the manner above mentioned.

"If the infection have spread in the neighbouring places, in the corridors, stairs, &c. the infected places are to be sprinkled with one or two glasses of liquid chloruret of lime, and the fetid odour will cease.

"Care must be taken to moisten frequently with the liquid contained in the tub, the sheet which covers the corpse: the reproduction of the putrid odour will be thus prevented.

"As soon as the body has been removed, the sheet which has served for the disinfection should be washed in large quantities of water, dried and folded."

On the Prevention of Putrefaction in Anatomical Pursuits.

Since anatomy is essential as the groundwork of medical knowledge, it cannot be unworthy of

attention to render the pursuit of it consistent with the safety and comfort of the student. That many lives are lost from slight accidents occurring in dissection is a fact sufficiently known and admitted; but that ill-health is too frequently the consequence of close application in the dissecting-rooms is not so generally known, although well ascertained by those engaged in teaching. My friend Dr. Armstrong has remarked that many of the worst cases of typhus fever which fall under his care occur amongst students, and unfortunately in those whose diligence affords the greatest hopes of their future labours proving serviceable to humanity. That illness should result from breathing daily, during many successive hours, an atmosphere highly impregnated with putrid effluvia, cannot be surprising; whilst the disgust which not unfrequently repels the younger student might be in a great measure avoided, by correcting the noisome odour which so generally pervades rooms in which dissection is carried on.

Some from habit become indifferent to the odour of the dissecting-room; but I am not aware of any sufficient reason, why any precaution, which can render the study of anatomy more safe or less unpleasant to those whose duty it is to become acquainted with that science, should be omitted.

There is perhaps no short road to this object:

though a process capable of counteracting putrefaction in a great degree may prove very serviceable, yet that alone will not suffice. Besides the utmost attention to cleanliness, and the removal of parts no longer of use to the student, a plentiful supply of water, without the labour of carrying it, a regulated temperature, and a properly adjusted ventilation, are essential, if the health and comfort of those engaged in the pursuit be of any value.

Were the public aware of the inconveniences and dangers to which a diligent student submits, before in the ordinary course of education he can acquire a sufficient foundation in anatomical knowledge, to enable him by the aid of more extended studies to become a safe practitioner in the healing art, so far from anatomical pursuits being opposed by public opinion, feelings of gratitude would supersede opposition, and be cherished towards those who could faithfully pursue at the risk of their own comfort, health and safety, a study which derives its value only from the power it confers of alleviating the sufferings of their fellow creatures.

The delight which is afforded by the investigation of the works of the Creator, can only be realized when the inimitable mechanism and structure of organized beings are sufficiently understood, to show their vast superiority over the imperfect contrivances of man: but before this

extent of knowledge can be obtained, all the disgust which generally attends the early progress of the student in anatomy must have been felt. I have known students who after much deliberation had selected the medical profession, as that in which their best exertions in the cause of humanity, might prove honourable to themselves, and useful to society, in whom this repugnance to anatomical pursuits was so strong, that it could only be overcome by a high sense of duty, and after many painful efforts, in some of which, the resolution far exceeded the physical power of resisting the appalling and humiliating spectacle of mutilated remains of human beings.

The regulation of the temperature of the air, surrounding those occupied in this sedentary employment is of sufficient importance to claim attention. In the severity of winter, during which anatomical pursuits are mostly carried on, the cold is often so intense as to render the student unable to continue his dissection for any considerable period. The mode of combining a regulated temperature and ventilation, which has been so successfully adopted in the Derbyshire General Infirmary, and more recently in the discovery ships under the command of Capt. Parry, an account of which has been published by Mr. Sylvester in his Philosophy of Domestic Economy, is equally adapted to dissecting-rooms as to hospitals or ships. By this method, whatever degree of temperature

shall be deemed appropriate, may be steadily maintained; and the ventilation may be so perfectly regulated, as to change the whole of the air in an apartment of ascertained dimensions in a given time. So far from these advantages being costly beyond the ordinary imperfect means in use, setting aside the first cost of apparatus and fixing, there is a much less expenditure of fuel than in open fire-places. This I believe has been fully ascertained in the London Hospital, which has lately adopted these improvements in a part of its establishment.

The covering of the tables with lead, or any other substance incapable of absorbing moisture, is advantageous, whilst a simple contrivance, a conducting pipe, for conveying any liquids from the table to a bucket underneath, prevents them from flowing upon the floor. Each table or pair of tables should have a water pipe with a stopcock and a moveable spout, and a constant supply of water, to be used whenever occasion may require; whilst to prevent the floor from remaining wet, either after being washed or after water accidentally spilled, it should be so inclined, as to carry off the water. The material of which the floor is composed, should be incapable of absorbing water —stone or stucco answers this purpose. These conveniences, as to cleanliness, are carried into practice in the dissecting-rooms of La Pitié, in Paris. The most strict attention to cleanliness,

and to the removal of all useless parts, should be carried into effect. A pipe conveying warm water, would also be attended with some advantages, and drains should be so placed, as to supersede the use of buckets, to carry off water which has been used.

The floor should be washed with chlorureted water, and afterwards with plain water when necessary. With these general precautions, the prevention of putrefaction is not difficult; the aspersion of the solution of chloruret of lime or of soda over the subject each time before beginning to dissect, removing with a sponge all superfluous moisture, and renewing the sprinkling should it be required during the work, will be sufficient to counteract putrefaction, and the odour resulting from it. When the dissection is discontinued, the covering of the subject with a coarse cloth or cloths moistened in the solution of the chloruret, should not be omitted; and the moistening of the cloths should be renewed night and morning. The proportions for this purpose, may be from twenty-five to thirty or even forty parts of water to one of the chloruret.

Should any liquids proceeding from the body, be spilled upon the floor, the place should be sprinkled freely with the chlorureted water, and then be washed copiously with a broom and plain water.

Both the chloruret of lime and of the oxide of

sodium have the disadvantage of discolouring the muscles when applied to them. To those therefore who wish to preserve the rich colouring and recent appearance of the parts, at the same time avoiding putrefaction, I beg leave to point out the means which I have found to answer in a great measure these purposes in private studies.

On the Prevention of Putrefaction, in conducting private Anatomical Studies.

It may seem superfluous to dwell upon the advantages of the student or surgeon in the country being enabled to renew his anatomical knowledge of parts important in their relation to surgical practice; and further, that he should be capable of doing this, even though a separate room or building cannot be obtained for the purpose. Whoever has felt the anxious responsibility of dangerous and intricate cases of surgical disease, when he could not have the benefit of consultation with those more experienced than himself, (and this is not a rare occurrence in country practice,) will appreciate the benefit conferred, by which he may be enabled to avoid the recurrence of such anxieties.

Much assistance may be derived from careful drawings, engravings or models of the more important parts of surgical anatomy. But he who by his attainments is the most qualified to derive

assistance from these aids to the memory, will nevertheless gladly avail himself of every opportunity of fixing the recollection more firmly, by the renewed examination of the parts, on his accurate and ready knowledge of which the safety and life of his patients must often depend.

It is sometimes an object to avoid the trouble of maceration and of injecting with wax or heated liquids: for ordinary purposes both these may be avoided; but if the beauty or value of the work be an object, then it behoves the student not to be sparing of his time and attention in the preparatory process.

For ordinary purposes a saturated solution of pure muriate of soda with a little nitre may be injected into the arteries without heat: this will considerably retard putrefaction; but does not preserve the florid appearance of the muscles.

Should it be desired to distend the blood-vessels with injection for the purpose of tracing them, I have found the following composition to flow more fully into the minute vessels than the compound of red-lead sometimes used, which, unless ground by the student himself, is seldom sufficiently fine to run minutely. Should it be desired to inject the minute vessels, a very small quantity of the fine injection, consisting of spirit varnish and vermilion or other colouring material, may be made to precede the following:

Mix a sufficient quantity of white-lead ground

in oil with vermilion to give the required colour, and thin it by adding turpentine varnish till the mixture be sufficiently fluid to be conveniently used with the syringe. This should be about the consistence of treacle, and should be gently and steadily injected into the arteries.

Should it be desired to inject the veins, rose-pink, with or without a little powder-blue, or the blue alone, may be used instead of the vermilion, and forms a sufficient contrast to admit of easy distinction. If either of these compositions be injected over-night, it will generally be sufficiently firm the next morning to admit of the dissection being proceeded with.

More care is required in the dissection, if it be designed to make a preparation, than when the wax injection is used; for the parts cannot be so freely moved out of their relative situations without breaking the injection within the vessels. It is also apt, unless great care be used, to contain air-bubbles.

The mode by which I have preserved parts fit for dissection during weeks, and even months, sometimes in summer, has been to macerate them in warm water, taking care not to overheat the subject, and to inject into the arteries a solution of nitrate of potash, either saturated or very nearly so, at the temperature of from 120 to 130 degrees; to let this be retained a few minutes, and then to turn the stopcock so as to allow any

part that might remain in the larger vessels to flow out; then, the temperature being kept sufficiently high to prevent the chilling of the injection, to throw in gradually a small quantity of fine injection, previously heated by immersing the vessel containing it in hot water; and lastly, to throw in rather briskly the wax injection of a proper temperature, so as to fill the larger vessels and to propel the fine injection into the capillaries. When cold, the dissection may be commenced. By these means the beautiful and florid appearance of the muscles is preserved or heightened: but the salt is apt to effloresce on surfaces which are long exposed: and if the cuticle be removed the skin becomes horny, the adipose substance oily, and, in short, in such a condition as to render the tracing of the cutaneous nerves impracticable. These inconveniences may be obviated by conjoining with the above the use of either the chloruret of lime or of the oxide of sodium:—for this purpose aspersions will seldom be required. If, when the dissection is not continued, the integuments, &c. be replaced, and the parts be surrounded with cloths moistened in a solution of the chloruret, the preservation may be effected for an indefinite length of time, sufficient at least to afford opportunity for a careful and complicated dissection, even when only a very few hours of each day can be devoted to the subject. Strict cleanliness must be observed;

and if in summer, care must be taken to prevent the contact of flies, lest a breed of maggots should result from the negligence: should any mucus or slime be formed on the exposed parts, it ought to be carefully removed by wiping with a sponge moistened in a solution of the chloruret.

By these precautions Mr. J. R. Alcock,—whose models in wax representing dissected parts of surgical anatomy were rewarded by the Society of Arts by their large gold medal,—was enabled to preserve portions of subjects in his private study at a period when a succession of parts could not be obtained.

The cooler the place in which the parts are kept when not in use, the less frequently will it be necessary to renew the attentions before mentioned: but I should recommend as a precautionary measure, that the examination be made at least once a day: and if the preparation can be placed in a current of air, and the moistening of the cloths be renewed as often as necessary, any tainted odour may be entirely prevented. The cloths should not be too much loaded with the liquid, all that is superfluous being squeezed out before they are applied round the subject.

On the Prevention of Putrefaction in conducting Pathological Investigations.

Little need be said of the great usefulness of pathological investigations; since it must be obvious that the knowledge of the changes induced in animal structures by disease is essentially necessary both to the physician and to the surgeon. Who for an instant could tolerate the absurdity of an artisan attempting to remedy the defect of a machine, with the derangement of which he was unacquainted?

Much of the difficulty of obtaining the sanction of friends to inspect the morbid appearances, when disease has proceeded to a fatal termination, may be obviated by a greater degree of attention than is generally used to avoid any unsightliness of the body after examination, and also to prevent that insupportable odour to persons unaccustomed to anatomical pursuits, which so frequently taints the apartment and furniture for many days afterwards.

I have known the carelessness of juniors, left without superintendence, harrow up the feelings of a parent by leaving portions of the body (cerebrum) of a child which had been examined, strewed upon the table on which the examination had been made,—a circumstance which cannot be contemplated without horror and regret. On

the other hand, when every proper attention has been shown to avoid the slightest indication capable of giving pain to surviving relations, and the putrid odour has been counteracted, the remark has been made that, so far from the disgusting and formidable anticipations of the friends having been realized, they have expressed their satisfaction that the examination had been permitted: adding, that had they not been informed of it they should not have been aware it had been performed, so perfectly undisturbed did every thing appear.

The moistening of the parts exposed during examination with the solution of chloruret of lime or of soda, and the subsequent sprinkling of the floor with the solution, will prevent or counteract the putrefactive odour; whilst the vessel used for receiving the water used in washing should have a portion of the solution poured into it. The towels and cloths used in the examination and in removing every trace of it, should also be immersed in a diluted solution of the chloruret.

Without these precautions, when a body far advanced in putrefaction has been examined, it has been known that the clothes worn by the operator and assistants on the occasion have been rendered useless, by the intolerable odour which they have retained; and even after every article of dress has been removed, and repeated ablutions

performed, the hands have retained the disgusting odour for many hours, in spite of every effort to get rid of it.

Both these inconveniences may be speedily remedied. If the solution of the chloruret be freely used during the examination no such putrid impregnation of the clothes can take place; and any offensive odour of the hands may be instantly corrected by washing first in a diluted solution of the chloruret and subsequently in pure water. If the putrefaction of the body be far advanced, it is desirable to moisten the hands with a solution of the chloruret on beginning the examination.

Clothes that have become tainted may be purified by hanging them up in a closet in which is placed an open vessel containing the solution of either of the chlorurets.

In embalming bodies these precautions become indispensable in hot weather, and more particularly in tropical climates. M. Labarraque mentioned to the Author an instance in which he had performed the operation of embalming, and which from the rapid decomposition of the body would have been perfectly impracticable without the aid of these disinfecting means.

In making anatomical preparations, particularly of the bones, in which it is usual to employ maceration till the soft parts become putrid and decomposed, the removing of the soft parts and

the cleaning of the bones is always a disgusting occupation, and not unfrequently attended with danger. By pouring a sufficient quantity of the solution of the chloruret into the macerating vessel a few hours before the cleaning takes place, the putrid odour is destroyed, and the bones after being washed and exposed to the air assume a degree of whiteness rarely to be obtained by ordinary means. This use of the chloruret has not, so far as I know, been pointed out in any publication with which I am acquainted. In some experiments made to ascertain the comparative value of the two modes, I found the result most satisfactory: and in the preparation of the more delicate specimens of comparative anatomy, I am fully persuaded that the use of the chloruret will be found both gratifying and serviceable to the naturalist.

In macerating preparations of soft parts in hot weather, the greatest care is required to prevent the destruction of the preparation by the putrefactive process. By adding a small quantity of the concentrated solution of the chloruret to the water used for maceration, this inconvenience may be prevented. Whilst on this subject, I beg to observe that Mr. Cocks, an ingenious and zealous member of the profession, who has cultivated drawing and the preservation of morbid specimens, has submitted to the Society of Arts an economical menstruum for the preservation of

morbid and natural parts, which promises to be useful by diminishing the expense of forming collections of wet preparations. Should it meet the approval of the Society, it will be published in their Transactions; and I should, I consider, be doing Mr. Cocks an injustice by publishing the particulars while the subject remains undetermined, although he has liberally made no secret of it when applied to by his professional brethren.

M. Labarraque has stated that anatomical preparations may be preserved in solutions of the chlorurets even in warm climates.

M. Braconnot, of Nancy, has published, in the 8th volume of the *Archives Générales,* that a solution of the red sulphate of iron (*persulfate de fer*) preserves animal substances in a very perfect degree.

On the Use of these Disinfectants in Tropical Climates.

The following document tends forcibly to exhibit the importance of the chloruret of lime as a disinfecting agent in tropical climates. It is translated from the 8th volume of the *Archives générales de Médecine,* p. 139 (1825.)

"We have under our eyes a number of the official Gazette of the Republic of Hayti, the *Telegpaphe* du 20 Fevrier 1825; and we read in it that experiments had been made at Port-au-

Prince by *M. Mirambeau,* inspector in chief of the service of Health, with the disinfecting chlorurets of M. Labarraque, and that they have been attended with complete success. A corpse in full putrefaction for three days, and exhaling at forty paces around it the most fetid odour, has been instantly disinfected by the solution of the chloruret of lime. Facts of this kind are sufficiently numerous in France since the important discovery of our learned countryman, and more than once we have entertained our readers with them; but they have scarcely been remarked. It is not the same at St. Domingo: under a devouring sky, where putrefaction advances with prodigious rapidity, where the miasmata acquire in a few instants a so fatal activity, and carry death into the bosoms of those who respire them,—a sure method of preventing the developement of them, and of destroying them when they already exist, ought to be, and has been in fact, hailed with a kind of enthusiasm. An eye witness, M. Mirambeau jun., at this moment in Paris, relates that simple aspersions have sufficed to purify the wards of an hospital, of which the bad smell was disagreeably felt even in the neighbouring houses. Other places have been equally disinfected with the same facility, and almost always in the presence of a numerous concourse of the inhabitants. The discovery of M. Labarraque is therefore one of the most precious, and we do not hesitate to

place it above that of Guyton-Morveau. But that it might be more generally appreciated in France, it was necessary that it should be performed abroad."

On the Disinfection of inhabited Wards of Hospitals, Sick-rooms, &c.

To those who have had opportunities of observing the dreadful ravages of disease when patients have been confined in a contaminated atmosphere, little need be said of the importance of a simple process for correcting or destroying the noxious inhalations which endanger both the sick and their attendants.

M. Labarraque relates experiments made during two nights at the Bicêtre in eight wards, inhabited and very infected. These wards, to the great satisfaction of the patients and of the physician who attended them, (Dr. Pariset, general secretary to the Royal Academy of Medicine, &c.) have been purified by means of sprinklings made with one bottle of the concentrated chloruret diluted with thirty parts of water. The remainder of the liquor served to disinfect the tubs placed outside the wards, and the privies of the lunatic patients. We may conceive that this mode of purifying places inhabited by a great number of individuals is very simple, of little expense, and must render important services

when applied to barracks, guard-houses, military and other hospitals.

Perhaps this might be the proper place to speak of the precautions necessary to prevent patients labouring under foul or gangrenous ulcers from being surrounded by a contaminated atmosphere: but as the treatment of these diseases is considered in a subsequent part of this work, the suggestions for obviating impurity are there pointed out.

M. Labarraque gives a preference to the use of the chloruret of oxide of sodium on man; stating that the action of the chloruret of lime would not be so efficacious, although it possesses as great a disinfecting power. For example: We shall be certain of destroying the miasmata which are developed in places inhabited by persons affected with diseases of bad character, if we are careful to sprinkle the rooms with one of the two liquid chlorurets, much diluted with pure water, or even by leaving it exposed on a plate in the sick-chamber; the chloruret must be renewed morning and evening, or when it shall have lost its peculiar odorous character.

Medical men or others, attending patients labouring under infectious diseases, will derive very great advantage from the liquid chloruret, if to the attention of respiring it on approaching these patients they join that of sprinkling it upon the floor, and principally around the beds.

On the Disinfection of Ships.

The same process as that for purifying a sick-room should be adopted: namely, that of sprinkling with the solution of chloruret the interior of the vessel twice a day or oftener. For this purpose, M. Labarraque recommends a spoonful of the chloruret to a bottle of water, increasing the strength if the fetor be considerable. It must be observed that the perfect ventilation of the interior of a ship is as essential to the health of the crew, as that of an hospital is to the health of the patients which it contains.

On the Purification of Putrid Water.

Another highly important use of the chloruret of lime has been pointed out by M. Labarraque in the purification of putrid water. For this purpose from one to two ounces will be required for about sixty gallons of the infected water. Mr. L. adds, " what I now advance has been verified at the commencement of the year 1824, by *M. Kerauden,* inspector general of the service of health of the marine, who at that time was charged by His Excellency the minister of the marine and of the colonies to make a report on my propositions, having for their object, the rendering healthy the vessels of the king, &c.; propositions which were adopted, and which I shall make known elsewhere. *Dr. Marc,* titulary member of the Royal Academy of Medicine, (who

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Another highly important use of the chloruret of lime has been pointed out by M. Labarraque in the purification of putrid water. For this purpose from one to two ounces will be required for about sixty gallons of the infected water. Mr. L. adds, " what I now advance has been verified at the commencement of the year 1824, by *M. Kerauden,* inspector general of the service of health of the marine, who at that time was charged by His Excellency the minister of the marine and of the colonies to make a report on my propositions, having for their object, the rendering healthy the vessels of the king, &c.; propositions which were adopted, and which I shall make known elsewhere. *Dr. Marc,* titulary member of the Royal Academy of Medicine, (who

in 1823 was delegated by the Council of Health to assist in my experiments on animal substances, privies, &c., and was one of the first who had a glimpse of all the applications of the chlorurets) was kind enough to be present at this disinfection of the water.

"The chloruret of lime is previously dissolved in water, and added gradually, stirring the vessel of putrid water till the disinfection be complete. If the chloruret predominate, it is sufficient to expose the chlorureted water for some moments to the air, and to filtrate it or leave it to settle, in order that it may become drinkable.

"We may readily conceive of what utility this process may be, whether at sea, or in marshy countries where the water is insalubrious, or even where persons are obliged to drink the water of cisterns, which is often altered."

Of the Disinfection of Workshops in which Animal Substances in a State of Putrefaction are employed.

The use of the chlorurets may be adopted with advantage in the business of the tanner, the glue-maker, the tallow-chandler, and various other manufactures, which at present, are perfect nuisances; but the most extensive employment, except in bleaching, has been made in the preparation of the intestines of animals, for making musical and other strings, and also dried intestines for the preservation of provisions, &c.

Although not essential to the object of this publication to enter into details on this subject, the following extract from *L' Art du Boyandier*, demonstrating the surprising powers of the chloruret of oxide of sodium as a disinfecting agent, may not prove without interest to the English reader.

The commission (Messrs. *Mérimée, Darcet Payen,* and *Pelletier,*) having met again in M. Labarraque's laboratory, the 16th August, 1822, various experiments on the intestines of animals were performed with complete success.

"The disinfection having been well proved by the examination of a dozen intestines of various animals, I offered to operate on a large scale: that is to say, upon fifty or a hundred intestines of oxen. But the Commission, having desired still more extensive operations, invited me to operate in a manufactory; and it was in the establishment of *M. Millan,* at Clichy, to which we were conveyed, the 19th August, at noon. The workshop was cleaned with as much care as the old work in progress admitted of; five windows on each side of the said workshop corresponding to each other were opened, as well as the two doors: the odour was not insupportable to me, who had already contracted a sort of habit of supporting it; but the members of the commission were most disagreeably affected,—they kept themselves at the outside of this immense work-place. The workmen had quitted their usual work, and had set

themselves to brush the casks and tubs, at first with water, then with that liquid containing about one thirtieth of alkaline chloruret of potash.*

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* A mode of expression used probably to conceal the real Preparation, the chloruret of oxide of sodium; the peculiar properties and manner of preparing which had not, at that time, been made known, and which Mr. L. feared might enable the "Islanders" to rival and undersell his countrymen in this manufacture.

The following quotation may serve to indicate the importance of this manufacture as a branch of national industry: "Si ce genre de fabrication était connu dans la Grande-Bretagne, nul doute que ces insuliares ne cherchassent à nous priver d'un produit qu'ils pourraient exploiter à notre détriment, en faisant de grandes expéditions en Espagne et en Portugal; ou s'en fait la plus grande consommation, et ou ils servent a conserver des comestibles animaux. Les Anglais feraient baisser les prix par des sacrifices que nos fabricans ne pourraient supporter, et une fois la destruction de nos ateliers opérée, ils seraient exclusivement possesseurs de ce genre de commerce, qu'ils sauraient ensuite rendre lucratif. Le commerce anglais connaît cette mamère d'opérer, et l'industrie de son pays s'en trouve bien."—*L' Art du Boyandier*, p. 63.

In extenuation of M. Labarraque's fears, it is but justice to add that this manufacture is so considerable as to be of national importance to France, since he has shown the actual annual value of the product to amount to 66,115 francs, for the ox intestines only; whilst before the manufacture was established, a price more than double that by which the estimate had been computed had been given for the manufactured strings, and the intestines of the oxen slaughtered thrown away as useless.

It is, however, right to state, that M. Labarraque has since that time freely communicated the mode of preparing the chlorurets, which will be found in a subsequent part of this work: Had Mr. L. been disposed to keep the preparation secret, its extensive usefulness must have secured to him an ample pecuniary reeompence: fortunately for humanity, he has preferred a nobler course.

The casks having been cleaned on the outside, I then poured into each of them three pounds of this same chloruret mixed with two pailfuls of water. The floor of the place was afterwards washed with a great quantity of water, containing alkaline chloruret. This effected, and the doors and windows having been shut, a *Guytonian* fumigation," (the process of Guyton-Morveau, by chlorine gas) " terminated the disinfection. All these operations required about an hour. After this time, the workshop was opened ; and the members of the Commission were able, during several hours, to devote themselves to their observations. In examining the place with the most scrupulous attention, one of the members found, at the end of the workshop, a large tub of fetid intestines. It had been forgotten, as may easily be conceived, since I had to give orders to eight or ten workmen, for a work which was not habitual to them, and to which they brought a degree of ardour so much the greater, as the Commission represented the authority which might be severe towards them, some members of the Council of Health, forming a part of it. This tub was disinfected.

" We informed ourselves of the number of intestines which the workshop contained; and M^de.^ Millan (whom in a note he mentions as directing exclusively the manufacture) answered, that it ought to contain at least, a thousand ox intestines."

Note of M. Labarraque on the Use of the Chloruret of Oxide of Sodium to disinfect and purify Stables.

The use of these disinfecting agents has been proved to be as valuable in relation to Veterinary Surgery, as in the various purposes already pointed out.

The chloruret of oxide of sodium will be of very great usefulness to render healthy and to disinfect contaminated stables, and those which shall have been occupied by sick horses.—It ought to be employed in the following manner:

Put a bottle of concentrated chloruret of oxide of sodium into a pailful of pure water, and stir the mixture.

Dip a strong brush or a broom into the chloruretted water, and immediately and forcibly brush over all the surfaces of the walls, the manger, rack, and all the parts generally, high and low, of the stable.

This being done, all the parts which have been moistened with the chloruret should be washed with pure water. In short, this process should be performed after the manner of painters, who lay a second coat upon the wainscot of an apartment.

A stable of forty feet in length by twelve in width and ten in height, requires four bottles of concentrated chloruret. Each bottle ought to be

diluted with about 24 pints of soft water. According to this, we may establish that one bottle is sufficient for a stable for three or four horses.

The disinfection of a stable being performed, the windows and doors should be opened to allow it to dry; then healthy horses may be kept in it without fear of their becoming infected. Nevertheless, in case of disease amongst horses, we ought as a prophylatic measure to make a watering, morning and evening, with a mixture of the chloruret prepared as follows:—One bottle of chloruret to four or five pailfuls of water; the stable to be freely watered with this mixture. Neither horses nor men sustain any inconvenience from this mode of disinfection, and great advantages in regard to salubrity are obtained.

For washing horses in the usual mode after they have been cured, and before allowing them to mix with those which are sound,—instead of vinegar and water, a weak solution of the chloruret may be substituted, such as used for the watering before mentioned.

These instructions are too short not to leave something to be desired under certain circumstances; but the knowledge of veterinary surgeons will supply whatever may be incomplete, and the modifications, which they may deem proper, according to the cases and the localities, will render this mode of disinfection perfectly efficacious.

On the Disinfection of Privies, Reservoirs of Urine, &c.

Pour upon two ounces of chloruret of lime three or four pints of water, and mix the whole: draw off the clear liquid, and pour the solution upon and into the privies and reservoirs.

If the bad small be not speedily destroyed, the operation must be repeated at the end of eight or ten minutes.

If the infection proceed totally or in part from urine or fæcal matters spread upon the ground, this must also be sprinkled or washed with the same solution.

Slight sprinklings should be renewed as often as necessary.

The Edinburgh Medical and Surgical Journal for Oct. 1826, after stating "as we have not hitherto taken any notice of this important discovery," gives an extract or analysis of a German work, the author of which had visited Paris, and had witnessed the use of the chlorurets.

"The next experiment was made with the public urine tubs of the *Palais-Royal*, the disgusting fumes of which render this almost an *experimentum crucis*. About a quart of the solution was mixed with the contents of one of them, and the urinous odour was completely destroyed in a single minute. Similar experi-

ments were made, with the same results, in the necessaries of the *Café de Variétés*, and the *Passage de Gymnase*,—places of which we cannot give a better idea, than by mentioning that no Englishman ever went to any of them twice."

On the ill Effects of Mephitic Vapours, in emptying Privies, Drains, &c.; and on the Mode of preventing these Effects.

In Paris the general want of sewers renders the emptying of reservoirs of excrements a frequent and abominable nuisance, which is sometimes inflicted upon the inhabitants of the most respectable hotels, without the slightest attention to the disinfecting process which M. Labarraque has pointed out,—so little is a man a prophet in his own country.

An English gentleman at one of these hotels observed, on returning home at night, some old dirty carpets hung up at the bottom of the staircase, and some ill-looking fellows lounging about. He could not proceed to his apartment without passing this barrier, and inquired what it meant. The answer was, "*pour empêcher le mauvais odeur:*" But as there was then no bad smell, the work not having commenced, he did not anticipate what was to follow. He went to bed, but was awoke by an intolerable and suffocating stench. He got up to open his window to admit

fresh air; but far from finding relief, the tubs which contained the filth occupied the street just under the window of his apartment, which was the *entresol* (or room between the parlour and the first floor), and the evil was so much increased that sleep became impossible, and he really thought he should be suffocated before morning: the thorough impregnation of clothes, furniture, and every thing in the room was the least part of the infliction; for he suffered a severe attack of bronchial inflammation, which rendered him unable to pursue his avocations for several days.

Whilst emptying the pits of nightsoil, the mephitic gas is developed in abundance, and fills the apartments of the house where the emptying takes place. We may guard against this mephitic odour by placing under the doors, on a paper spread for this purpose, a train of dry chloruret of lime, and by extending thick linen cloths, steeped in the aqueous solution of this chloruret behind the same doors: the windows and other apertures require the same precautions. In this manner the fetid smell does not penetrate into the apartments.

In acting thus upon a part of the floors of a house, and purposely omitting to use the same precautions in the intermediate floors, we shall find that these are infected, whilst those which have been defended by the chloruret, contain pure air only.

In a note read last year to the Society of Medicine in Paris, after relating a case of asphyxia in which the patient was immediately relieved by the chloruret of the oxide of sodium, M. Labarraque has added the particulars of emptying the pit or cess-pool of his house on the night of the 22nd of March, 1824.

The details (which may be found in the *Journal général de Médecine,* and in the *Archives*) are very clearly and circumstantially related. Some of the floors were defended with the chloruret, and remained perfectly untainted; whilst the floors in which these precautions had not been used were uninhabitable. He calculated from this experiment, (which also was so conducted as to protect the nightmen from injury during their dangerous and noisome work,) that the expense of completely disinfecting a pit during the emptying of it, by means of the chloruret of lime, would increase the expense about sixty per cent; an amount which he considers may prevent the general adoption of this process.

Although such may be the result in France, yet no English family of respectabilty would undergo the infliction of one night's stench, were the additional expense of preventing it tenfold.

The same effects may be produced by the chloruret of oxide of sodium.

The following interesting statement by M. Labarraque, related in his work *De l'Emploi des*

Chlorures, &c. shows the danger of such emanations and the safety which the chlorurets are capable of affording.

Mr. L. proceeds:

"At the moment this notice is in the press a new fact has come under my observation. I deem it useful to relate it here.

"*M. Paulin,* manager of the general administration of the drain St. Martin, came to me the 11th August, 1825, to solicit, on the part of *M. Berard,* vice-president of the Council of Health, some chloruret of lime, with the manner of using it to disinfect a portion of the drain or sewer, *Égout Amelot*, where several workmen had fallen into a state of suspended animation the preceding day. I offered my assistance in the projected operation. The nightmen were ordered for the cleansing of a portion of the sewer, from about twelve to fourteen feet, which was to be effected the next day at eight o'clock. The slime and filth to be raised were four feet and a half deep.

"I caused to be placed, not far from the sewer, a tub containing about sixty litres (about fifteen gallons) of water, with one pound of the chloruret of lime well diffused in this liquid. A pailful of this liquor was placed by the side of the workmen occupied in demolishing the wall; and these workmen, at the moment of raising the demolitions, washed their hands and arms, and moistened their nostrils with the chlorureted

water. The nightmen took the same precaution in carrying away the soil, which, thrown some feet above their heads and mine, was watered with the solution of the chloruret, then projected by a workman upon the surface of the ground; this slime, by means of a renewed sprinkling, was further disinfected. The operation lasted more than four hours, and without any accident occurring. Whether through deference to me, or, perhaps, because I had impressed upon them my conviction of the efficacy of the disinfectant employed, these workmen were obedient to my advice. The security in which they witnessed me during the whole of their dangerous and unpleasant work,—merely holding a smelling-bottle of chloruret in my hand, and sometimes under my nostrils, may have also contributed to that effect. Nevertheless we were in a sewer infected and impracticable for more than forty years*, and in which eight workmen were seized with asphyxia a short time after having penetrated into it. This unhappy event, which occurred in 1782, was the subject of an essay by *M. Cadet de Vaux*, which gave rise to the splendid researches of the celebrated professor *Hallé*, and may more recently have contributed to those of *Messrs. Thenard*, *Dupuytren*, *Barruel*, &c.

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* See the interesting work of *M. Parent-Duchatelet* entitled "*Essais sur les Cloaques ou Égouts de la Ville de Paris.*"

"It may be seen that the *Égout Amelot*, left to itself on account of the just dread which it inspired in the workmen and the authorities, contained a considerable augmentation of filth, which augmenting daily would in the end have entirely obstructed it. Will it not be possible to effect the emptying or cleansing of it without having to deplore these fatal accidents?—such was the question which I proposed to myself whilst I was surrounded by deadly emanations,—a question which I believed myself able to answer in the affirmative: but to attain this end it would be necessary to combine the wind furnace of *Darcet*, (one of the most useful applications I am aware of,) with the abundant use of the chloruret, and with many other precautionary means relating to health which should be indicated by the localities.

As I was preparing to descend into the sewer, a woman in tears came to solicit assistance from the chief of the workmen. Her husband was one of those struck with asphyxia and who had been attacked in the severest form; he had lost all recollection during a long time, since he had been carried to No. 48 *rue des Tournelles*, without having recovered his senses. A vomit was administered: the physician, considering the frightful misery of the patient, advised him to be carried to an hospital, and believed his advice had been followed. The patient nevertheless

wished to remain at home: he had been vomiting for forty eight hours the weak tea which had been given him, and several times within this period he had lost his recollection. I directed some remedies: acidulated water, &c.

"The emptying of the sewer being almost finished, I desired to be conducted to the patient. The vomiting had ceased after the first cup of acidulated gum-water. This man, aged 41 years, had the appearance of decrepitude. *Pierre Aimé* lay upon a pallet; his pulse was miserable; he complained of severe pains in his head, and of great weight; he said he had great difficulty in breathing, and that he was tormented above all by the bad taste which he had constantly in his mouth, and which he said was *that of the stench* (plomb) *which had made him lose his recollection:* his voice was almost extinct, and he believed that he had but few moments to live. I raised the spirits of this unfortunate man, by assuring him that he should speedily be cured, and that his wages should be paid the same as if he had been at work: at the same time I made him respire the vapour of some concentrated chloruret, which he seemed to suck in with delight; his features appeared less shrunk. *Pierre Aimé* assured me that he breathed more freely, and that he had no longer the bad odour in his mouth. The next day I learned that the patient had slept five hours; he called for *the water which had relieved*

him from so great a weight and pain in his head; I sprinkled diluted chloruret in his chamber. The 14th August *Pierre Aimé* was cured; he had been able to get up and go out. I informed myself of the circumstances of his accident: "*A building stone,*" said he, "*having fallen among the filth of the sewer and having stuck there, I raised it a little with my pickaxe; and stooping, my two hands before me to lay hold of it and raise it, I fell without recollection, and as if struck with death.*"

"The effect of the chloruret will perhaps appear surprising in this instance, considering the time which had elapsed since the asphyxia (48 hours). However, persons who have respired the gas which is disengaged from animal substances in putrefaction, must have remarked that they are pursued for a long time by the fetid odour, and that even their excretions are partly impregnated with it. It therefore appears to me rational to make the patients respire the chloruret of oxide of sodium or of lime, in all cases of asyphyxia arising from sewers or privies, however long after the event the patients may have been under the influence of the deleterious gas."

Note of Experiments lately performed in Paris by Mr. John Roberts, Inventor of the Fire-escape, or Miner's-Hood, under the inspection of the Board of Health; combining the Use of the Chloruret of Lime with the advantages derivable from his invention.

Notwithstanding the advantages derived from the use of the chloruret of lime in emptying the Égout Amelot, as detailed by M. Labarraque, it appears that the sewer surrounding the Bastile had, by its noxious vapours, been rendered impracticable for many years; and that all attempts to penetrate it by ordinary means having failed, Roberts was required to enter it to show the superiority of his fire-escape hood, as a test that must at once decide the merits of his invention.

It will be recollected, that Mr. Roberts was rewarded by the Society of Arts last year for this hood*; he was afterwards repeatedly solicited to visit France, for the purpose of exhibiting the surprising security which in England it had been

* See the 43d volume of the Transactions of the Society of Arts, which contains a detail of the experiments made to determine its usefulness, the description of the instrument, and an engraving explaining its several parts. It was also noticed in various periodical publications at the time the experiments were performed in London.

demonstrated to be capable of affording. Roberts had caused a *brevet d'invention* to be taken out in France.

This humble, though highly meritorious indidual has perfected several useful inventions, for which he has been twice rewarded by the Society of Arts, without having received even the common rudiments of education. The information contained in this note is therefore from his (Roberts's) own verbal communication, Dr. Filkin happening to be present, a memorandum of which was made at the time and read over to him: he confirmed the accuracy of the statement.

Besides the experiments here related, he mentioned having performed several others in presence of the authorities; from which it appears that he was enabled to remain in a suffocating atmosphere, produced by burning straw, sulphur, &c., for the space of fifteen minutes, with the assistance of his hood, the sponge of which was moistened with cream of lime; when the longest period any of those who attempted to enter the place with the mere aid of a moistened handkerchief, and alkaline and other solutions thus used, was half a minute, the first inspiration rendering them incapable of longer sustaining the suffocating vapour.

First Experiment.—When Roberts was in Paris, he was required to shew the efficacy of his apparatus, by entering the sewer of the Bastile,

which it was stated to him had not been cleaned for 37 years, and that an attempt made 15 years ago had proved fatal to two persons. The sewer was a circular tunnel about 6 feet high, and about 2 feet deep with mud, slime, and filth. He descended by a shaft, which was about 12 feet deep, by means of a ladder, having his miner's hood previously affixed round his head, and the sponge moistened with chloruret of lime dissolved in water, procured for him by M. Darcet.

He took a light with him, which burned dimly but was not extinguished;—he carried the tube of the hood round his waist, and supported the end of it by his left arm. He advanced one hundred yards from the shaft, and experienced no uneasy sensation, neither did he perceive any bad smell, although at the top of the shaft, before putting on the hood, the odour was "very unpleasant and deathly"—he was told the smell was that of sulphureted hydrogen: a paper, which he believes was moistened in a solution of lead, and which was white when he went down, was completely blackened. Some persons at the top of the shaft became affected with dizziness from the smell, his interpreter a medical man, though he did not descend, becoming so ill that he was obliged to go to bed in consequence of headache.

A young man without a hood, after Roberts had remained fifteen minutes in the sewer, came down the ladder: he was ordered by M. Darcet

to enter within the sewer 10 or 15 feet, to ascertain how it would affect him. Roberts was going onwards when the calling out of the young man, aided by signs, (for neither could speak the language of the other,) informed him that he was about to fall. Roberts retreated back and saw him out. He was to have carried the light and to have emptied a bottle previously filled with mercury; but he was unable to proceed. Roberts took the light from him, and proceeded onwards and emptied the bottle containing the mercury, about 30 yards from the shaft, corking it again. Roberts went alone beyond the next shaft:—these shafts are distant about 90 yards from each other. Opposite the next shaft, there was less slime but more water, the depth being the same. Afterwards, when R. had returned to the bottom of the shaft, a tarpauling was let down and placed close to the shaft, within about 2 feet, on the side furthest from the river: it was nailed to the clefts between the stones, and then bags of sand were let down to make a dam to prevent the sludge from running down below that part: it was built about a yard high; but not to the top, the tarpauling completely occupying the space above.—Persons were able to place these bags at the bottom of the shaft. Roberts and the workmen then came out. A furnace was placed over this shaft, and a new communication made between the shaft and the river: and by this new communication

the emptying of the sewer from the sand bags to the river was effected!*

M. Darcet expressed his admiration that a person brought up in the mines should have had skill, perseverance and humanity sufficient to enable him to perfect so useful an invention.

This experiment took place before the Board of Health, in July, 1826.

2nd Experiment.—Roberts did not know that any thing more remained for him to show respecting this place: he was ordered to attend again: but did not think that he had to go in again. He was directed to go down another shaft, and take a line and measure the distance from one shaft to the other, those employed being unable to find the entrance to the other shafts owing to their having been covered by ruins, and none of their men would venture to go within the sewer. They told him this was a more dangerous place than the other. He was not provided with his hood which had the trunk; he therefore put on a hood weighing only three quarters of a pound, and without

* This useful application of the furnace, the Editor believes to be the invention of M. Darcet, previously mentioned in this Essay. The shaft by which Roberts and the workmen had descended, having the furnace placed over it and luted at the bottom, insured a current of air from the sewer, whilst its place must have been supplied by an equal current of pure air, drawn in at the communication before mentioned, and also at the mouth of the sewer, which remained open.

the trunk, the mouth-piece consisting of a sponge which he moistened in the same solution as that used in the former experiment. He went down, without any inconvenience, except when near the other shaft he felt a little stench, but nothing of any consequence. He carried a light: he went to the next shaft, and made a knot upon the line to measure the distance. One end of the string was passed over one of the staves of the ladder, and a workman was stationed at the foot of the shaft to communicate between Roberts and those at the top: but the man was unable to remain till Roberts returned.

Roberts made the measure—about one hundred yards, but the line having become entangled, they were not satisfied that there might not be an error. He therefore again washed and moistened the sponge in the chloruret, replaced it on his head, and remeasured the distance. He subsequently went three times, and with a long pole attempted to strike the covering or roof of the shaft, so that it might be heard on the surface; but the pole, eighteen feet long, did not enable him to reach it, the shaft here being, he thinks thirty feet deep. He returned to the surface without injury: he had stripped off all but his breeches and long boots. He was heated and perspired. After washing and dressing, he went about as usual. The test paper was still more blackened than in the former experiment; as

black as a black coat, and all the metal (brass) about the hood was much tarnished.

The following copy of an official certificate by the Baron de Plazanet, Lieutenant Colonel Commandant of the Corps of *Sapeurs Pompiers*, confirms the valuable uses that may be made of the hood, in the prevention of fatal accidents from mephitic vapours, and also in enabling firemen and others, to rescue individuals from houses on fire. Several hoods have been made by order of the Prefect of Police.

(A COPY.)

Ville de Paris. Corps des Sapeurs-Pompiers.

Après trois experiences faites devant, Messieurs les Officiers du Corps des Sapeurs-pompiers de la Ville de Paris, qui toutes ont porté a conclure que la coiffe invente par le Sieur Roberts pouvait être d'une très grand utilité dans l'extinction des incendies, Monsieur le Commandant de ce Corps a fait un rapport à Monsieur le Préfet de Police, et ce Magistrat a ordonné qu' il fut sur le champ confectionné un certain nombre de ces coiffes ce qui a été mis à éxéeution.

Je me plais à certifier la verité de ces faits et je desire, dans l' interêt de l' humanité que mon certificat puisse engager les personnes chargées du service des incendies ou des mines, à faire confectionner des coiffes du même genre, bien persuadé que je suis qu'elles puevent préserver de beaucoup d' accidents graves.

fait à Paris, le 31 Aôut, 1826.

Le Lt. Colonel Commandant

le Corps des Sapeurs-Pompiers, de la Ville de Paris.

BARON DE PLAZENET.

It is to be remarked, that in entering sewers or other places filled with putrid effluvia, the solution of the chloruret of lime is the proper antidote with which the sponge should be moistened: in descending wells, where carbonic acid gas is accumulated, the cream of lime, (a mixture of pure lime with water to the consistence of cream,) or a solution of caustic alkali, should be used:* the same when there is any acid vapour, as from burning sulphur; whilst for the most useful and urgent purpose, that of entering a room or building on fire, to rescue human beings, the moistening of the sponge in water only will generally suffice.

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* Before descending any well, an essential precaution is to ascertain whether the air be capable of sustaining life or not. If a light be incapable of burning, the air is not fit for respiration: a large quantity of water poured down by means of a watering pot, has the double advantage of absorbing carbonic acid gas, and by disturbing the confined air in its descent, of mixing atmospheric air with that part of the gas which may remain. If a watering pot cannot be procured, the water may be poured abundantly, by pailfuls over a broom, so as to divide it as much as possible.

Recent experiments and researches, by M. Laurens, Professor of Chemistry and Pharmacy at Marseilles, tend to shew, that the chloruret of lime possesses the valuable property of neutralizing the deleterious effects of carbonic acid gas.—Further notice of his experiments, will be found in a subsequent part of this work, under the head ASPHXYIA.

Of the value of Disinfecting Processes in the Prevention of Disease and in arresting the progress of infectious disorders.

After the facts enumerated in the preceding parts of this Essay, it would be a work of supererogation, to dwell upon the advantages that may be derived from the use of the chlorurets, in destroying putrid and noxious effluvia, which, in their least injurious degree, produce disease, and when most concentrated, occasion asphyxia and death.

No one who reflects on the use of the external senses, can doubt that they are bestowed for the salutary purpose of acting as centinels, to give warning of the approach of whatever may be hurtful or dangerous, and the sense of smelling is not in this respect inferior in usefulness to the other senses.

The prevention of disease is more important than the remedial treatment, since by prevention, the pains and danger of sickness are avoided.

Next to the prevention, the value of arresting the progress of infectious disorders, must be apparent; for in periods of great pestilence, the dread of infection has even deprived the sick, at the time of utmost need, of those cares and attentions due from fellow beings to each other as duties of humanity.

The efficacy of acid fumigations, and still more decidedly those by chlorine, has been sufficiently established; the former by the sanction of a parliamentary reward. The acid fumigations are however disagreeable in sick rooms and inhabited wards; whilst the irritating properties of chlorine in its gazeous state, upon the organs of respiration, preclude its adoption in inhabited places.

The Penitentiary at Millbank, in which the mortality was at one time so great, as to become a subject of parliamentary investigation, was some time ago submitted to fumigation by chlorine, under the direction of Mr. Farraday. The process occupied four days, all the passages and openings being carefully stopped with mats, &c. The quantity of materials used was, seven hundred pounds of common salt, seven hundred pounds of manganese, and one thousand four hundred pounds of sulphuric acid. The space fumigated was about two millions of cubic feet, and the surface of the walls, floors and platforms, about one million two hundred thousand square feet, mostly in stone and brick, and chiefly plastered with lime.

The chlorurets of lime and of soda, however possess the beneficial properties of the chlorine in destroying putrescent and infectious effluvia, without its noxious and irritating qualities; by the chlorine which enters into their composition being given off only in proportion to the presence

of aerial or other substances, for which it has a greater affinity than the bases with which it was previously combined in the form of chloruret.

Although both these chlorurets possess great powers as disinfectants, M. Labarraque has pointed out the circumstances under which the one should obtain a preference, whilst the other is liable to some disadvantages.

At the sitting of the Royal Academy of Medicine, 14th May 1825, M. Virey communicated an old table of the diseases which afflicted the army of Spain in 1812, by Dr. Estienne, from which it results that the chloruret of lime scattered between the beds of the patients affected with typhus, produced in the most infected hospitals very advantageous effects.

At the sitting of the 28th May, M. Labarraque said that the mode in which the chloruret of lime had been employed in the army of Spain in 1812, had no relation to the process by which he now employs that substance. In fact, in the army of Spain, they had no other purpose than that of disengaging chlorine in a less troublesome manner than by the process of Guyton de Morveau; whilst he employs at this time the chlorurets of lime or of soda in substance, (*solution*, Ed.) so as to apply them to the infected matters, and to immediately destroy their putrefaction. (*Archives* T. VIII. p, 278.)

The Sanitary Council of the Lazaretto of

Marseilles ordered, in December 1825, that the chlorurets should be substituted instead of fumigations in the Lazarettos, for the purification of passengers, apparel, luggage, &c. for those afflicted with plague, or suspected of other diseases, as well as for the daily purification (assainissement) of ships in quarantine.

Since this work was sent to the press, the author has been favoured by communications from M. Labarraque, in which he states that his expectations have been realized at the lazaretto of Marseilles. The typhus of ships, (*typhus nautique*) was brought there by a Greek vessel, in May 1826; and also by a Spanish ship in August 1826: neither the quarantine surgeon who had the care of these patients, nor the nurses who attended them were infected; they were *preserved from this disease solely by the use of the chlorurets;* whilst in 1818 this disease, brought to the lazaretto by a single coasting-pilot, who was nursed and attended in the very same place where the patients of 1826 were lodged, and under the same conditions, was communicated to the nurses and to the quarantine surgeon, and extended its ravages, notwithstanding the daily employment of Guitonian fumigations.

Although formerly, during a period of nearly ten years, when the author had the medical care of the Saint James's Infirmary, he had frequent opportunities of observing the beneficial changes

effected by the removal of patients, labouring under fever, from their confined and ill ventilated apartments to well regulated wards, where every attention could be immediately commanded; yet he has since witnessed a more speedy improvement by conjoining the use of the chlorurets with such general means as those above alluded to than under any circumstances, without the aid of these powerful agents.

How highly valuable the means of preventing infection must be, both in giving confidence to the ordinary attendants, and also to those whose duties require them to administer medical relief or religious consolation to the sick, need only be pointed out to be appreciated; for under the imperfect means in general use neither the duties of the medical attendant nor of the clergyman can be performed with safety; hence many valuable lives have fallen sacrifices:—of the devotion of those of the former class to the duties of their office, it behoves not one, himself a humble member of the medical profession, to speak:—of the devotedness of many worthy and meritorious clergymen in the performance of their sacred office of administering religious consolation to the sick, regardless of personal danger to themselves, he bears willing and ample testimony.

Dr. Robert (*Guide Sanitaire*, p. 793, 1826) has remarked:

"The success which has been obtained in the

course of last summer to combat, to arrest, or to prevent the disease which attacked horses, a disease which may be considered as a pestilential epizootie, or gangrenous typhus, imminently contagious, leads us to presume that they (the chlorurets) may be equally efficacious in the pestilential diseases of man, and with so much greater reason, since the experiments recently made by M. Lisfranc, surgeon in chief of the hospital La Pitié, in Paris, prove that the air of wards where small-pox patients are confined, no longer communicates the disease, whilst daily sprinklings with solutions of the chlorurets are employed."

Last year, M. Labarraque communicated personally to the author, that the infection arising from measles, which had occurred in a boarding school, had been perfectly arrested, without the removal of any of the pupils, this security from infection having been effected by the free use of the chlorurets. The value of this fact may be readily appreciated by those who have known the anxiety caused to parents, and the serious loss and inconvenience to the proprietors of establishments for the instruction of youth, in which any infectious disease has occurred.

The beneficial results already obtained in arresting the ravages of infectious diseases, afford a well grounded presumption that the chlorurets may also be effectual in preventing the ravages of the plague, the yellow fever, and other pestilential

disorders; and perhaps the period is not far distant when these dreadful scourges will no longer be dreaded, and that the first benefit from the use of such powerful disinfectants, namely, that of allowing patients labouring under these pestilential conditions to be approached with as much security and confidence as when afflicted with the ordinary diseases of our own climate, which under certain unfavourable circumstances are known to be communicable from one individual to another, may subsequently lead to improved modes of treatment, which shall in a great measure divest even the plague itself of its terrors.

The Report of the Commission relating to health at Marseilles, charged by the administration to make experiments on the use of the chlorurets of oxide of sodium and of lime, in the lazaretto of Marseilles, to the superintendants of the public health, contains many valuable suggestions. This Report, which is dated the 8th December, 1825, was communicated by the Minister of the Interior to the Academy of Sciences in Paris, at its sitting of the 3d of February last.

The following are Extracts from the Experiments recommended by the Commission to be made in the Hospitals for persons labouring under the Plague.

1. Washings and aspersions with the chlorureted water to be made in the wards several times every day.

2. Tubs containing chlorurated water are to be placed in the same wards, so as to keep up a continual evaporation of the chlorurets.
3. The physicians, almoners, servants and all those who take care of the sick, before approaching them, and in quitting them, to wash their hands with chlorureted water.
4. The same persons to make use of smelling bottles filled with chlorurets, and to moisten the openings of the nostrils therewith.
5. Applications of the chlorurcted water to be made to the buboes, the carbuncles, and the gangrenes of persons labouring under the plague.
6 Smelling bottles or sponges imbibed with the chlorurets are to be frequently brought near to the nostrils of the same patients.
7. Water containing half a dram or one dram of the concentrated chloruret of oxide of sodium to each pint, to be given to the patients afflicted with plague as their common drink.
8. The baggage, apparel, &c. of pestiferous patients, and of those suspected to conceal some contagious principle, to be exposed to the evaporation of chlorureted water, which is to be heated to give it greater activity.
9. The apparel which is not likely to be deteriorated by the chlorurets to be washed in these solutions.

The same precautions are applicable to private houses, in which persons labouring under the plague may be confined.

The strength of the solution of the chloruret of lime for the aspersions, &c. should be one part of chloruret to thirty of water.

The use of chlorureted baths for the patients, medical attendants, &c. is suggested as a proper precautionary measure; and further to be used by the crew of any vessel in which contagion has

prevailed, or which is not furnished with proper certificates of health.

The same Commission has made the following comparison between the guitonian fumigations, and the use of the chlorurets.

"The Commission has considered that the guitonian fumigations always do harm from the inconveniences which they occasion to those exposed to them, since gazeous chlorine is one of the substances which act upon the organs of respiration in the most disagreeable and hurtful manner, which is the cause of these fumigations being badly performed, and often wholly omitted. The Commission has thought proper to replace them by aspersions with chlorureted water, persuaded that the chlorurets possess much more efficacy than the former, since the active substance of both is the same, and every thing leads to presume, on the contrary, that its effect is more prompt in the manner in which M. Labarraque employs it, and causes no inconveniences, since the chlorurets of oxide of sodium and of lime do not exert any disagreeable or hurtful action upon the organs of respiration. Another great advantage which they possess over the guitonian fumigations is that the most polished metals, such as copper, iron, and steel, are not in any degree attacked by them. This property is proved by the report of *M. Pariset* to the superior Council of Health, whilst every one knows that the vapours of chlorine,

however disseminted they may be, attack and deteriorate all the common metals.*"

Of the use of the Chloruret of Lime as a disinfectant, compared with the Chloruret of Oxide of Sodium.

M. Labarraque observes, the honourable assent which the authority, enlightened by men of learning, has condescended to grant to his process of disinfection, has seemed to establish a preference in favour of the chloruret of lime over the chloruret of oxide of sodium. These two chlorurets are equally proper to arrest putrefaction: but nevertheless they have not the same secondary properties. He explains: in the act of the disinfection of a putrid animal substance, the chloruret passes into the state of hydro-chlorate, and the hydro-chlorate of lime having the property of absorbing humidity from the air, fixes it upon the disinfected body. Now, one of the conditions of putrefaction being humidity, it fol-

* This remark applies to metals exposed to the evaporation from the chlorurets, not to the metals in contact with solutions of the chlorurets, which tarnish silver, brass, &c. Neither does the admixture of the chlorurets with water, prevent the usual effects of moisture upon certain metallic substances.

Notwithstanding this limitation of the sense in which the sentence quoted above should be understood, the contrast between the exposure of metals to the vapour from solutions of the chlorurets, and to gazeous chlorine is sufficiently striking. —Ed.

lows that once the disinfection performed, the chloruret, after a longer or shorter time according to its quantity, has changed its state, and furnishes one of the conditions fit to reproduce the putrefactive odour. The chloruret of oxide of sodium, on the contrary, in passing into the state of hydro-chlorate, gives place to the formation of a very dry salt, which acts as a preservative by coagulating the principle which commences putrefaction. This is what he calls a secondary property. Thus the chloruret of oxide of sodium will suit whenever we wish to disinfect a body, and prevent the renewal of putrefaction; it will be fitted above all for applications to wounds of a bad character, by the property which it possesses of detaching the portion of the tissue already disorganized from that which retains its vital properties: whilst the chloruret of lime, *if it be well saturated*, for by keeping, the *disinfecting* and bleaching property of the chloruret of lime is weakened, can only serve for a simple disinfection, that is, for the exhumation of a corpse which is to be immediately examined; it is also fitted for the disinfection of the dead bodies deposited at the Morgue, because the sprinklings with chlorureted water are renewed several times daily if it be necessary.

M. Payen (Journal de Chimie Med. p. 516, 1836) has shewn that the dry chloruret of lime at 98° contains a much larger quantity of chlorine than the solution of the chloruret of soda; namely, in the proportion of 9800 to 480, or nearly 20 to 1.

Of the general precautions and management required in combination with the disinfecting processes.

From the preceding observations those who have not devoted themselves to the study of medicine might be led to suppose that the processes of disinfection before pointed out should be all that might be required to render salubrious the foul wards of hospitals and other places occupied by the sick; this would be an unfortunate conclusion, for the fact is far otherwise: although the pestilential effluvia diffused in such an atmosphere be capable of immediate correction, yet unless the cause be removed, the regeneration of similar effluvia is not prevented. Hence, therefore, the most rigid attention to cleanliness and appropriate ventilation is essential to the welfare of the sick; for although the chlorurets may destroy the putrid miasmata, they cannot furnish that supply of pure air, without which health cannot be sustained, nor disease be successfully treated. Many persons are in the habit of using fumigations of vinegar, of aromatic pastiles, and of diffusing perfumes to cover any bad smell which may pervade the sick chamber: these practices are however founded in error; for if due attention be observed with respect to cleanliness and ventilation, not only with the accumu-

tion of disagreeable effluvia be prevented; but the apartments of the sick will be kept as sweet as any room in a well regulated dwelling house: there is no perfume equal to a perfectly pure atmosphere, and the best test of that purity is the total absence of any odour whatever.

Not only should strict cleanliness be observed, but those precautions be superadded, which may prevent even the momentary impregnation of the air surrounding the patient with putrid or tainted effluvia. If the discharges from a patient unable to quit his bed or his room, be received in a vessel containing cold water, much of the unpleasantness of the sick room will be prevented; and in the removal of dressings, poultices, &c. from patients labouring under ulcers, particularly those of malignant character, and attended with offensive discharge, the same precautions should be observed: these are the means which common sense might dictate, when no better can be obtained; but by the previous addition of either of the chlorurets of lime, or of oxide of sodium to the water in which these matters are received, the putrid effluvia are instantly corrected or destroyed. The immediate removal of all such substances, though often omitted, is too obviously a part of good management, to require comment.

The linen, lint, &c. which have served for the dressing of foul ulcers, retain their odour for a long time, and contribute to the insalubrity of the

places where they are deposited: by pouring a glassful of the concentrated solution in ten pints of water, and steeping these linens in this liquid, should they be required for further use, they may be immediately taken out, washed and dried, having lost their odour. These precautions are not likely to be required, unless under peculiarly necessitous circumstances, as on board of ship, where a fresh supply of linen is not to be obtained.

Of the use of the Chloruret of Oxide of Sodium, more particularly as a remedy in the treatment of Disease.

Notwithstanding the Chloruret of Oxide of Sodium, is generally to be preferred in its external application to the living body, as well as for internal use: yet it will be found in the subsequent pages, that the chloruret of lime may also be occasionally employed with advantage.

Whenever a new remedy is offered to the public, it is apt to be considered a *panacea*, a remedy for all diseases. To prevent such an impression, I shall take the liberty of pointing out what *may be effected* by the judicious use of the chloruret of oxide of sodium, and what *ought not to be expected*: or in other words, what it can, and what it cannot do.

The chloruret of oxide of sodium, in common

with that of lime, has been shewn to possess the valuable property of destroying the most putrid effluvia arising from animal substances, even when these effluvia are diffused to a considerable extent in the surrounding atmosphere; it has also the property, when applied to the substances giving off these effluvia, of arresting or destroying the progress of putrefaction: not only does it possess this power with regard to dead and detached animal substances; but in those distressing forms of disease, in which a part or parts of the living human body become dead and putrid, whilst yet attached to the contiguous tissues which preserve their vitality; it has the inestimable power of speedily ameliorating this most loathsome condition, by destroying the putrid odour emanating from the dead portions; and it moreover, generally arrests the further progress of decomposition, and promotes the more speedy separation of the dead parts from the living, than can be obtained by ordinary means: it very often is capable of changing the nature of malignant, corroding, and destructive sores, into the condition of simple ulcers: in many ulcers not malignant, it is capable of greatly hastening the cure. In short, though not an infallible remedy, it is capable, under the guidance of medical and surgical skill, sound judgment and experience, of alleviating, and often of totally removing some of the most distressing and loathsome diseases to which the human body

is liable; diseases which too often, uncontrolled by remedies previously in use, have hurried numerous victims to untimely graves.

No individual, deeply impressed with the importance of his duties towards those who intrust their health, their lives, to his professional care, can suppose, that these beneficial results, should be expected from the hap-hazard or indiscriminate use of any remedy, however powerful: No—the healing art is not so simple, and the treatment of a dangerous and complicated disease, where even a very slight error may cost the life of the sufferer, requires not only an extended knowledge of the resources which medicine, in the most comprehensive sense of the term, can afford; but that this knowledge shall be seconded by unremitting and vigilant care, to abstract or prevent whatever may be injurious to the patient—to bring into action, whatever may be capable of contributing towards the restoration of health.

I might here enlarge upon the ordinary, unostentatious and humble duties which the surgeon, anxious for the welfare of his patients, must cheerfully submit to perform; duties which attract no applause, and frequently prevent those more severe inflictions, the greater operations in surgery; operations, which strike with admiration, those who may not be competent to discuss the important question, whether it might not have been possible, nay practicable, to have averted

such a disastrous termination: but the observations contained in this work, are not addressed to the tyro to induce him to make random experiments, and thus to trifle with the health of the unfortunate individuals, who may happen to fall under his management; but to my professional brethren, whose active humanity, ample knowledge, and experience, enable them to combine with a valuable local remedy, all the collateral aids, both physical and moral, which the healing art is capable of affording. In such hands, I feel assured, that the value of the chlorurets will not be diminished by the more extended use of them in surgical practice.*

Impressed with these views of the duties of the surgeon in the cases in which I have employed the chlorurets, I have freely availed myself of those collateral aids, which a tolerably ample experience has proved to be beneficial in the treatment of disease; I have preferred the simple duties of humanity, to any affectation of scientific accuracy, in determining how much may be

* To those of my younger brethren, who may wish to know my opinions respecting the ordinary duties of the surgeon, I may refer to an Essay on the Education and Duties of the General Practitioner in Medicine and Surgery, published in the Transactions of the Associated Apothecaries and Surgeon-Apothecaries of England and Wales: also to a series of Lectures delivered to the Students of the late Borough Dispensary, and which have since appeared in the Lancet.

effected by the use of the chlorurets, under the omission of all the auxiliary means which common sense and a knowledge of the principles of surgery should point out; although, exclusive of my private practice, the habitual allotment of a portion of my time, to those whose humble circumstances preclude remuneration, might have afforded ample scope for experiment, could I for a moment have entertained the idea, that the recovery of a humble patient, was of less importance than that of another whose circumstances might be more fortunate.

The reciprocal influence which exists between local disease and constitutional disturbance, is well known to those who have faithfully studied the medical profession; it is this knowledge, which often leads the careful and experienced observer to adopt combined modes of treatment, with the most beneficial results, when perhaps the disease shall have existed for many years, and have resisted a series of remedies, not fulfilling all the indications which a comprehensive view of the case should readily suggest.

Hence the advantage, nay, the necessity of the full investigation of every important case; and it is only surprising, that so obvious a preliminary should on many occasions be overlooked or disregarded. Should an artist, by way of getting rapidly through his engagements, assume that certain general proportions might suffice for every

portrait, and that a mere glance should be sufficient to give the detail, he would find himself mistaken, and the failure would be evident; he would speedily find out, that to produce a resemblance, he must carefully study the peculiarities of form, as well as the general proportions of each individual portrait.

In the investigation and treatment of disease, it is still more necessary to consider every case as a separate study; how otherwise, or by what magic, can the means be faithfully adapted to the end?

Let an instance be supposed, say that of compound fracture; and such instances unfortunately are not unfrequent, of a patient suffering dreadful torture from the spasmodic twitchings of the injured limb: the mere routine attendant, who does not think of tracing these distressing symptoms to their cause, orders opium, perhaps a castor bolus, or any other article that may be uppermost in his list of antispasmodics; the spasms increase both in frequency and in violence, so that the limb is agitated, every spasm inflicting additional injury, notwithstanding the splints, &c. with which it may be enveloped; locked-jaw, or tetanus of the whole body supervenes, and death closes the scene!—Let the same case fall under the care of one who takes nothing for granted, without endeavouring to trace the cause of any untoward circumstance: he finds the limb agitated

by spasm and readily traces the cause to a slight accidental displacement of the position of the limb, by which the points of bone are forced into the muscles—a sufficient cause of irritation and spasm: instead of having recourse to the *materia medica* he exercises some share of common sense, places the limb in a perfectly natural and easy position, and takes care to prevent its future displacement: he relieves the patient from pain; all dread of recurrence is prevented by simply pointing out the truth; the spasm ceases, and the patient enjoys a tranquil sleep, without opiate.

This example might almost supersede any remarks on what the use of the chloruret *can not* effect: neither that nor any other remedy can supply elementary knowledge, nor the habit of tracing cause and effect, without which the best applications may be so injudiciously employed as to produce evil where good only is intended.

The use of the chlorurets cannot confer manual dexterity, which in surgery is essential to carry into effect the dictates of a clear judgment: what avails it, for instance, in the treatment of an irritable and painful ulcer, that a judicious surgeon should observe, that to the use of a local remedy, ought to be joined a certain degree of external support, by bandage or other means, to a limb in which the preternatural distension of the blood-vessels, is one of the causes of the protraction

of the disease? The use of the chlorurets will neither confer that tact which shall render the application of a bandage soothing and beneficial in proportion as it is equally and properly applied; nor can it prevent the ridges and furrows, the uneasiness and increase of pain, which often characterise the awkward and injurious use of the bandage.

The adaptation of the means to the end in the treatment of disease requires constant vigilance, and a greater regard for the welfare of the patient than for any preconceived opinions; remedies which may be the most appropriate at one period, often prove detrimental under other circumstances; and no remedy can be so universally applicable as to preclude the exercise of a scientific discretion, and what is of still higher value—common-sense.

General Observations on Hospital Gangrene.

The destructive progress of hospital-gangrene, although not uncommon when many wounded patients are crowded together under the unfavourable circumstances, which, in the course of war, leave to the most intelligent medical officers only a choice of difficulties, is yet sometimes met with in civil hospitals. When this disease prevails, the slightest injury or wound is apt to assume this pestilential form which rapidly

destroys the life of the part affected, taints the air with putrid and noxious odours, and more frequently terminates in the death, than in the recovery of the unfortunate sufferer, unless his timely removal from the contaminated atmosphere, which there is good reason to believe often engenders the disease, avert his fate; or, what has been less generally carried into effect previously to the valuable discovery of M. Labarraque, that the progress of putrefaction be arrested, the pestilential emanations destroyed, and the corroding and destructive progress of the disease give place to the separation of the dead parts, and thus change the patient's condition, from a state of dreadful and almost hopeless suffering to that of safety and recovery.

During the heat of summer it is no uncommon circumstance, for flies attracted by the putrid odour, to deposit their eggs, so that innumerable maggots are seen preying on the putrid mass, whilst yet attached to the living human being: a condition from which we naturally turn away with disgust and horror: neither is it so simple a matter to prevent this occurrence as may at first sight appear, nor to correct it when it has occurred; I have witnessed it not only in hospital-gangrene, but even in compound fractures, where the fears or views of the surgeon lest the limb should be disturbed, have prevented that strict attention to cleanliness, which is the best pre-

ventive; nay maggots have even been known to find their way into wounds produced by surgical operations, such as amputation and the like. That such distressing occurrences may he prevented, when ample means can command every attention, no one, who reflects, can doubt; but it sometimes happens even in hospital practice where men of great skill and acknowledged humanity preside, that the ordinary duties are left in a great measure to juniors, who, however well disposed, do not possess sufficient experience to foresee and guard against errors, which may appear slight in the first instance, but are often attended with distressing or disastrous consequences.

The following extracts from the late Mr. John Bell's Principles of Surgery, a work which will remain a lasting memorial of the extensive knowledge, zeal and humanity of its lamented author, convey so vivid a representation of the verminous ulcers and of hospital gangrene, that the reader may be enabled to estimate the value of a mode of treatment by which these dreadful and too often fatal diseases can be deprived of their horrors and be converted into the condition of simple ulcers.

"When ulcers are long neglected, the worms which breed in them give a dreadful appearance to the disease This is a shocking accident, very often seen in moist and warm countries, in the autumnal season. In hospitals where men are brought with deep, large, long neglected sores, worms breed

very fast, and most especially in those parts on which the patient lies, so as to prevent its being cleaned; 'At Stirling, in Scotland,' says Wiseman, 'all those wounded in the back and hinder parts were full of maggots, not having been dressed for some days.' Though plainly this kind of ulcer, the ulcus verminosum, proceeds from uncleanliness, from flies being allowed to deposit their eggs in a nidus, very fit for hatching them, yet with such rapidity are the worms brought forth, and such myriads are found crawling in the basin of a great sore, that one can almost excuse the ignorance of the older physicians, who absolutely believed that the worms were generated by putrefaction merely, without any deposition of eggs."

"I never shall forget the sight I once saw in our well regulated and cleanly hospital, where there was such an exhibition of *Ulcera Verminosa*, as perhaps never was seen by Parée at the siege of Turin. Dr. Aitken had taken an apprehension that we were too apt to trouble sores by officious dressing, and being deceived, like many others, by the wonderful reunion of fresh wounds, when laid together, and not dressed for eight days, he formed this promising conclusion, that, as according to the common saying, the "blood is the best balsam for a wound," "its own foul matter should be the best balsam for a sore." He resolved not to dress the sores of the surgical wards at shorter periods than five or six days, but that the matter might not run through the bed during that period, he made the nurses gather all their old sponges, and applied to each sore a sponge. Four or five days after, a great many gentlemen attended in the wards, on the tiptoe of expectation for the further issue of this experiment! each sore, as it was successively opened, was in a horrible condition, "the worms they crept in, and the worms they crept out," and the doctor was in great disgrace till he discovered the cause. He had given the nurses very strict injunctions about cleansing their sponges, which they very strictly obeyed; but each sponge, after being washed, was laid by the window to dry; it was hatching season with the great flies, who were very glad of the sponges to deposit their eggs in; and when these eggs were laid into the sores, and kept there for some days with all the

advantages of such a situation, they did hatch with a vengeance. Dr. Aitken's vindication of himself, may be seen in his "Principles of Surgery."

"Excepting such ulcers as these which I have described, none, I believe, are entirely local; every great ulcerated wound becomes so from a fault in the constitution, not from the ill disposition of the part. This at least is the case in every dangerous ulcer; and this observation very naturally occurs to me, when I proceed next to speak of the *Hospital Sore*, which I would not regard as a mere ulcer, to be treated like other common ulcers, but as a general affection of the system, a mortal disease, for when it rages in a great hospital it is like a plague; few who are seized with it can escape.

"There is no hospital, however small, airy, or well regulated, where this epidemic ulcer is not to be found at times; and then no operation dare be performed: every cure stands still, every wound becomes a sore, and every sore is apt to run into gangrene: but in great hospitals especially, it prevails at all times, and is a real gangrene; it has been named the hospital gangrene, and such were its ravages in the Hôtel Dieu of Paris (that great storehouse of corruption and disease), that the surgeons did not dare to call it by its true name, they called it the rottenness, foulness, sloughing of the sore! the word, hospital gangrene, they durst not pronounce! for it sounded like a death-bell; at the hearing of that ominous word, the patients gave themselves up for lost. In the Hôtel Dieu this gangrene raged without intermission for two hundred years, till, of late, under the new government of France, the hospital has been reformed."

"If the patient is to die, the gangrene or wasting of the cellular sheaths proceeds; the skin first sloughs off, then the fascia is destroyed; those lamellæ of the facia, which dive betwixt the muscles to enclose, protect, and nourish them, are next affected; the matter continues slimy and thick, and in prodigious quantities; the muscles are divided from each other more and more. In many who suffered under the dis-

ease at the same time with Joiner (the boy above mentioned), you could have laid your hand edgeways betwixt the several muscles of the thigh. Then the vomiting, diarrhœa, and nervous symptoms increase, the pain is dreadful; the cries of the sufferers are the same in the night as in the day-time: the ulcers continue to eat down and disjoin the muscles, the great vessels are at last exposed and eroded, and they bleed to death. Thus, a lad of the name of Handling who had at the first but a slight wound in the thigh, had the cellular membrane, in the course of a few days, so destroyed, that you could put your clenched fist into the hip, and could lay the hand sideways betwixt any two muscles of the thigh. You could have counted each muscle, as in a dissection, from the tuber ischii to the ham. The branches of the Profunda Femoris first gave way, then the sciatic vessels; for three nights, he lost two or three pounds of blood each night: it would have been almost cruel to have stopped the hœmorrhage, had it been possible, so very desperate was his situation; on the fourth day he died. I hope and believe, that these scenes have made a lasting impression on the few who have witnessed them.

"These are the forms which this disease assumes, when it attacks an amputated stump, a broad and open wound, a laceration of the skin, or any surface which is apt to become a flat sore. But when it attacks a narrow wound, as a bullet wound, a wound with any pointed instrument, even the prick of a nail in the finger, it assumes at once the form of an Erysipelatous Gangrene (Erysipelas Gangrenosa;) and when this disease prevails in the hospital, you may see even a nurse, from some slight hurt in the hand, which at another time could have done no harm, have one day a swelling of the wound, on the next an erysipelas of the arm, with dreadful pain and low fever; on the third day, the arm will become livid, and covered with vesicles, and in two days more, fall into gangrene; the woman oppressed in the meanwhile with hiccup, low delirium, and other symptoms of approaching death."

Although hospital gangrene is apt to spread to an alarming extent, and is too well

known to be highly contagious when patients are crowded together, and though it might from its name be supposed to be confined to hospitals or places where numbers are brought together, yet whether from peculiar states of health or from local circumstances, the same condition of wounds or ulcers may supervene in private life, and when it cannot be traced to any direct infection or contagion; although in some occupations, such as those of the tanner, the butcher, &c. it may sometimes be directly traced to the contact of putrid animal substances with the wounded surface.

A case of hospital gangrene, resulting from an abscess in the axilla, occurred at no very distant period, and came under the care of a surgeon, whose ample knowledge and rank in his profession enable him to state with equal candour what is not known, as well as what is fully ascertained. He observed that although numerous instances had fallen under the treatment of his colleagues and himself, and although great care had been employed, and very various modes of treatment adopted, still the result had been so generally unfortunate, that he was free to confess he knew of no remedy which was certainly capable of arresting this dreadful disease: a junior colleague had confidence in arsenic; the senior, having known the poisonous effects of that mineral, induced by its application to wounds, stated his reluctance to have it employed, unless as a last

resource; but added, that as he himself was unacquainted with any remedy on which dependance could be placed, if his colleague was confident of the benefit to be derived from the application of the arsenic, he might take the charge of the patient and get him well. The arsenical solution was freely used, but without any beneficial result, although personally applied by the gentlemen to whose care the patient had been transferred; the sloughing extended from day to day, the odour being most intolerable, till death terminated the unfortunate patient's sufferings.

The multiplication of the names of diseases, and the consideration of the diseases when thus named, as so many abstract beings or essences have been far from advancing the practical resources of the healing art: many conditions which are described as separate diseases are little more than the same diseased or morbid process in various degrees of intensity or in successive stages; and very often under the influence of physical agents, which act favourably or unfavourably upon the living body; whilst the progress of disease not unfrequently is as decidedly influenced by mental impressions, by hope, by fear, or despondency, as by the physical agents the presence of which may be more easily demonstrated.

Hence, the more extensive the knowledge possessed by the physician or surgeon of the phenomena of health and disease, and of the

various circumstances which constitute the *juvantia* and *lædentia* of the healing art, the more comprehensive will be his view of any given instance of dangerous disease, and consequently the more directly will the means, which this clearsightedness enables him to select, be adapted to the end they may be designed to accomplish. Diseases are not so simple as to be susceptible of being removed by any single remedy, however powerful it may be, when judiciously adapted to the circumstances of any individual case; neither can any absolute rules supersede the judgment which should determine not only the appropriate remedies, but the combinations, modifications, and details of the remedies when selected, which shall render them perfectly adapted to the existing circumstances of any given instance of disease.

The terms phagedenic ulcer, gangrene, sphacelus, mortification, &c. may all in succession happen to apply to a single individual case; and the prevention or speedy correction of the condition indicated is of more importance to humanity than the discussion of the term or terms by which such condition may be designated.

Hospital Gangrene, Phagedenic, Syphilitic, and other Ulcers.

The following numerous instances of the beneficial applications of the chlorurets in the

treatment of disease, have been collected partly from the works of M. Labarraque, and partly from the various scientific journals and other works relating to Medicine and Surgery in which they have appeared. The author has added observations on cases which have been under his own care, or have fallen under his immediate observation in the practice of his friends.

M. Jules Cloquet, adjoint surgeon in chief of the Hospital Saint Louis, has used the chloruret of oxide of sodium successfully to gangrenous ulcers: in several of these extremely severe diseases this able surgeon has caused the mortified limb to be bathed in the chloruret diluted with ten or fifteen parts of water, and has given inwardly from twenty-five to thirty drops of the chloruret of oxide of sodium in a pint of ptisan. His observations will be published.

Professor *Marjolin,* surgeon in chief of the Hospital Beaujon, has used the same chloruret to gangrenous affections, whether this state occurred after the amputation of a limb or from any other cause; he observed that the eschar became quickly detached, and that the disease was limited in the greatest number of instances.

Dr. Ségalas, associated professor at the Faculty of Medicine, at the end of physiological experiments, said more than two years ago, "that the physician ought to be very reserved in the application of this substance (the chloruret) to denuded

tissues, and especially in its injection into the genitals. Diluted with water it is less irritating, and does not on that account preserve less of the precious qualities which have placed it among our energetic remedies.* Now,† says he, I support this latter proposition by two cases of cure of gangrenous diseases, very recently performed under the influence of this agent, commonly called the *liquor of Labarraque.*"

The one of these facts has been observed upon a man affected with a gangrene, the consequence of an infiltration of urine, (*the description of the disease follows*) and moreover the patient's scrotum was quintuple in size, infiltrated with urine and sphacelated at its lowest part, in an elliptical extent of four inches in the direction of the raphé, and of from two inches to two and a half in the opposite direction. I incised the exchar deeply, I left the lips of the wound to disgorge, and I passed a fine catheter into the urethra; I then applied lotions to the dead parts with the chloruret of soda in its pure state;‡ the place, the bed, and the chamber were instantly disinfected. I finished by dressing with lint impregnated, with the same liquid diluted with four times the proportion of water. The next morning, to my

* *Journal de Physiologie experimentate*, July, 1823.

† Journal de Chimie Médicale, 1825, p. 272.

‡ Chlorure d'oxide de sodium.

great satisfaction, I found several of the eschars detached and the patient in a very favourable state. I repeated the dressing of yesterday; in the evening the wound was vivid on its whole surface. I ceased to use the chloruret, ten days afterwards the wound was entirely cicatrized. The second observation is relative to a horse treated by *M. Bouley*, jun. veterinary surgeon, and which will be spoken of subsequently.

An unfortunate case of gangrene from infiltration of urine, occurred lately at the Westminster Hospital. The patient was an old man, who had for several years had stricture in the urethra, but without urgent symptoms, having continued his work till within a day or two of his coming to the Hospital. He was admitted on a Friday, labouring under complete obstruction of urine. Attempts to pass the catheter did not prove successful. During the night the urethra gave way and the scrotum became enormously distended with urine. On the Saturday the parts containing the extravasated urine were in a state of mortification, of a dirty brown and greenish hue. The scrotum was freely divided, and a considerable quantity of urine oozed out. The odour was horribly offensive. The unfortunate patient sunk and expired on the Sunday. The chloruret was not used.

A case of a gangrenous affection of the cheek, cured by the chloruret of oxide of sodium of

M. Labarraque, was communicated to the Royal Academy of Medicine, at its sitting of the 10th April, 1823, and inserted in the *Revue Medicale*, by Dr. Rey. This case is also mentioned in the first volume of the *Archives*, p. 617.

Observations relative to venereal ulcers complicated with hospital gangrene, cured by means of the chloruret of oxide of sodium by M. Grosse, M. D. principal surgeon of the army, and surgeon in chief of the Hospital of Picpus, at Paris. This memoir was read to the section of Surgery of the Royal Academy of Medicine, at the sitting of July 24, 1823, and inserted in the 14th volume of *Recueil de Memoires de Médecine de chirurgie et de pharmacie militaires*, published by order of his Excellency, the Minister of War. As this work is not published for sale, I consider it useful to make known the first of these observations.

"P*** corporal of the 16th regiment of the line, entered the military Hospital of Picpus, the 29th January 1822, for a chancre on the prepuce and a bubo in the right groin. He was treated by frictions: the bubo suppurated at the end of some days, and was opened by the bistoury, The chancre healed very well, but the wound from the bubo, which was a little extended, remained stationary during more than five months, notwithstanding the most appropriate local and general treatment.

"At the end of this time, the gastric and pulmonary organs were the seat of a great irritation; the wound from the bubo changed into a corroding ulcer, which inflamed and became painful: the suppuration from it was fetid and extremely

abundant, the hospital gangrene supervened, and in a few days the ulcer invaded a great part of the skin of the abdomen. The patient was separated from the others.

"The inflammation of the alimentary canal nevertheless did not resist a proper treatment, but the hospital gangrene continued its ravages. All the means employed in similar cases were put in requisition, the ulcer again put on a favourable aspect.

"The mercurial treatment, which had been suppressed, was resumed, and all went on well enough for some time.

"A short time afterwards the same accidents re-appeared with much greater intensity, and nearly carried the patient to his grave. The same means employed again produced a second time a momentary relief; but some time afterwards there occurred a new return of the accidents, which were again calmed; P***, in a word, remained during nearly a year between life and death.

"The patient continued in the following state the 16th May, 1823, the date of the first application of the chloruret of soda: extreme wasting and weakness; inflammation of the gastric and pulmonary organs, gums spongy and fungous, skin dry and parched, continual constipation and want of sleep; the ulcer extends from the anterior superior spine of one ilium to that of the other, passing over the abdomen, two inches and a half below the umbilicus; it descends on each side between the scrotum and the thigh; its aspect is horrible, it occasions dreadful pains: the edges are swollen, jagged, turned back here and there, and all the skin which forms them is loosened. The suppuration, very abundant and very fetid, is mixed with the blood which the corroded vessels allow to escape.

"This patient is dressed three times a day with dossils moistened in the chloruret of soda, in the proportion of two ounces to four of water. On the next day the odour of the chloruret had replaced that of the hospital gangrene: the proportion of the medicament was increased one ounce, and the same mode of dressing was continued; the day following, there was no longer any fetid odour, scarcely any suppuration; the surface of the ulcer was very favourable, the edges were flattened; the cicatrix proceeded from the circumference to

the centre, and showed itself at the same time on various points of the extent of the ulcer: the other inflammatory symptoms had disappeared.

"On the fifth day the chloruret was applied pure; the cicatrix advanced rapidly: the ninth day the inflammation was too intense, the use of the chloruret was suspended, and the ulcer dressed dry: the fungous flesh was cauterized with the solution of nitrate of silver. The chloruret was resumed towards the fourteenth day, and on the eighteenth there remained only some small ulcerated spots. P——had recovered his appetite, he walked with crutches: gradually his strength returned, and he is now radically cured.

In the second volume of the *Archives* it is mentioned that M. Gorse (Grosse?) presented for the examination of the members, a soldier whom he had cured of a foul venereal ulcer, extending transversely from one groin to the other, by the application of the liquor of M. Delabarraque (Labarraque). The confusion of proper names in French medical literature, has sometimes afforded amusement to the English reader, more frequently it is a source of perplexity, not easily obviated.

Respecting venereal ulcers, a memoir was read at the Royal Academy of Medicine, in a notice on the use of the liquid known under the name of *reactive* of M. LABARRAQUE, in the local treatment of certain ulcers, by M. CULLERIER, Surgeon to the Venereal Hospital, Member of the Royal Academy of Medicine, &c. and published in the *Archives générales de Médecine,* T. I. p. 448, 478; and the *Annales de la Médecine Physiologique*, April 1823.

M. Cullerier the nephew, Surgeon of the Venereal Hospital states; that he had only at that time been able to employ the *eau de javelle* (one of the terms used to designate the chloruret of oxide of sodium, before the mode of its preparation was made known) in fetid, sanious, chronic ulcers which distinctly presented incipient hospital gangrene. My trials, he observes, have been performed in five cases of reputed syphilitic ulcers, between the toes and at the base of the nails (rhagades onglades); in two cases of corroding fetid ulcers, the one at the vulva, the other at the groin, the consequence of a bubo in a man. With all these patients the disease had resisted both general and local remedies during several months.

The action of the remedy was very prompt: these surfaces which exhaled at each dressing an insupportable stench, which left on the lint a layer of ichorous pus, lost their fetid odour at the first and second applications. With one of the patients who had deep ulcers between the first and second toes, and between this and the third, the odour has not been so quickly destroyed; this was occasioned by the remedy not penetrating to the bottom of these ulcers, for as soon as it arrived there by means of immersion of the part and by injections, the disinfection took place.* The

* Mr. Frederick Price, Aldersgate-street, has used the chloruret successfully in similar cases.

odour of chlorine replaced the putridity kept up by a sort of local fermentation. The chloruret of soda destroys it, and puts the ulcers into a favourable condition for cicatrization; this is also effected in a short time. Two of these patients were cured in five or six days, so that we may really consider the reactive in these cases as a mean both of disinfection and of cure.

At the sitting of 30th June, 1825, of the Royal Academy of Medicine, M. Lisfranc informed the section of Surgery, that for some time past he had used with success the chloruret of lime in the treatment of atonic ulcers.

M. Girard added, that he had also employed this remedy with advantage in the treatment of the carbunculous affections which had been complicated with the epizootic disease which had prevailed amongst horses.

Royal Academy of Medicine, 11th August, 1825.

M. Lisfranc informed the Section (of Surgery) that in burns of the second degree, and after having used emollient cataplasms for two or three days, he has successfully employed the chloruret of lime; the solution marked three degrees of the chlorometer of Gay Lussac, he thinks that this remedy would be equally useful in hospital gangrene. This proposal furnished to Messrs. Maingault and J. Cloquet, the opportunity of announcing that they had just observed two cases of that disease in private practice, which is very rare;

the two patients were in very opposite conditions; the one rich, living in a very healthy quarter, the other poor, and placed in a very different situation. M. Ségalas also related that very recently in a case of chronic catarrh of the bladder, undoubtedly complicated with ulceration of that organ, he had succeeded in weakening and even arresting for a time the infectious odour of the urine, by injecting into the bladder a fluid to which a certain quantity of the chloruret of lime was added. (*Archives* T. 9, p. 138.)

Royal Academy of Medicine, 27th August, 1825.

Monsieur Lemaire communicated some cases which prove that a solution of chloruret of lime in the proportion of one part of the salt to three of water, has been very useful in cases of ulcers: they have become cicatrized in eight or ten days. M. Laubert asserts that in military hospitals, this good effect of the chloruret of lime has been already ascertained. M. Vauquelin relates that Dr. Chamseru has long employed the oxygenated muriatic acid, diluted with water, and taken as a drink in syphilitic diseases, but that the irritation of the stomach had rendered it necessary to abandon it; the urine and stools were pale and quite colourless. *Archives Généralés de Médecine,* T. 9, p. 140.

The chloruret of oxide of sodium, was used with very good effects in the ulceration resulting from gangrene of the cheek, in a boy aged about

nine years, a patient of Mr. Ollier, Surgeon to the Western Dispensary. The boy had laboured under fever, and the destruction of the cheek had taken place, before he came under Mr. Ollier's care. The dead parts had separated, leaving a great part of the lower jaw perfectly denuded; there was a copious and offensive discharge, which evidently, by the fetid odour of the breath, must have tainted the air respired by the patient. A solution of the chloruret, in the proportion of one part to six of water, was applied to the ulcerated surfaces, and the dressings moistened with the same solution from time to time: the putrid odour immediately disappeared; the necessary attention was paid to the general health, which was extremely disordered, the patient laboured under excessive diarrhæa, (a circumstance far from unusual, when the system is under the influence of putrid emanations,) and was in a state of extreme danger. The condition of the ulcerated surfaces rapidly improved, the diarrhæa ceased, and the strength of the sufferer gradually increased: the solution of the chloruret, there being no longer any putrid odour and the surfaces granulating kindly, was changed for the black wash, and when I last saw the patient, he was in a fair way of recovery.

In a case of mortification of the foot and part of the leg of a patient, aged fifty, the mortification having succeeded fever, and the exhausted condi-

tion of the sufferer precluding all hope of recovery, the putrid odour was entirely corrected by the ablution of the dead parts, with a diluted solution of the chloruret of oxide of sodium, and the application of lint moistened in the concentrated solution, twice a day.

M. Lisfranc*, Surgeon in Chief of La Pitié, has had the good fortune to preserve the limbs of several patients, which were about to be amputated, by applications of the chloruret of oxide of sodium, and he has been enabled to say with truth to his pupils; *henceforward, there will be no longer any gangrene* (pourriture) *in Hospitals, thanks to M. Labarraque.*†

In cases of phagedenic ulcerations of the genitals, the author has used the chloruret of oxide of sodium, with decided advantage. In the treatment of these cases, the general principles of surgery were kept in view, and care was taken to avoid those circumstances, which, on a careful review of each case, appeared to have exerted an unfavourable influence. He may here be permitted to observe, that such distressing cases seldom take place, unless under peculiar circumstances of the patient's health, or through errors, more frequently depending upon the patient than the medical man: for not unfreqnently, the mischief is done before the patient seeks surgical assistance.

* Guide Sanitaire, page 799. † A bold assertion.—Ed.

In one instance, the patient had laboured under a corroding ulcer, which had destroyed a considerable portion of the dorsum penis, and had penetrated under the corona glandis; there was frequent hemorrhage from the deeper parts of the ulcer; there were other ulcers in the groin. The patient had been ill four months, and had been confined to bed for several weeks; he was desponding, owing to the frequent returns of hemorrhage, and the continued progress of the ulceration; the discharge was thin, copious, and extremely offensive. The surrounding parts were hard, of a deep red, and greatly swollen. Indeed, the appearance was sufficient to give cause of alarm. He suffered much pain. The chloruret of oxide of sodium was applied to the ulcerated surface, the poultices and other applications which he had been using, were left off: his mind was relieved by the assurance, that notwithstanding the frightful appearance of the part, he would soon do well; his diet was put under strict regulation, and such attentions afforded, as his general health, which had suffered greatly, required.

The relief from pain, after the dressing with the chloruret, enabled him to obtain a good night's rest, the first, he declared, which he had had for several weeks: the offensive odour of the discharge was corrected; the ulcer became cleaner, and granulations appeared; the hemorrhage did not return, and in a few days the corroding ulcer

was reduced to the condition of a common healthy sore. The swelling, hardness, and redness of the surrounding parts, speedily abated. He was obliged to resume his avocations, before the sore was healed: he was under the necessity of taking much exercise, and of managing the dressing of the part as well as he could, with merely occasional professional assistance. Under these disadvantages, though the sore was divested of all danger, its progress was variable, and a considerable time elapsed, before it was completely healed.

In another case the patient had been ill only a fortnight; but so rapidly had the ulceration proceeded that a large portion of the upper and back part of the prepuce had been destroyed, and the glans protruded through the aperture, the remaining part of the prepuce hanging down under the glans: the glans was ulcerated over nearly its whole surface. The solution of chloruret of oxide of sodium was applied to the ulcerated parts, and rest, and regular diet, with other antiphlogistic means, strictly enjoined. In two days the extension of the ulceration was checked and the parts began to granulate, and to assume the appearance of a common sore. In a few days the pendulous portion of the prepuce was removed and the parts healed under common treatment.

I might contrast the favourable progress of

these cases with an instance of recent occurrence in which a phagedenic ulcer nearly surrounding the penis was allowed to proceed, under the use of mercury, poultices, opium, &c. till the uretha ulcerated, and the urine was discharged by the fistulous opening thus produced. Although, as before intimated, the chlorurets cannot furnish medical or surgical knowledge, their use in such cases is capable of producing great benefit, if the general treatment be free from error.

On Chronic and ill-conditioned Ulcers, more particularly those of the lower extremities.

The frequency of ulcers of the legs; and the tediousness of their progress render it highly desirable that a remedy capable of contributing to the comfort of patients afflicted with ulcers, and of expediting the healing process should be generally known to the profession.

Ulcers of the leg are often combined with varicose veins, and under such circumstances not unfrequently continue open for years, resisting the usual methods of treatment. Ulcers of any considerable duration are seldom if ever entirely local; the general health becomes deranged, and it is only by combining constitutional and local treatment, adapted to the circumstances of each particular case, that the greatest benefit can be afforded to the patient. To such appropriate

treatment the local use of the chloruret will be found a valuable addition.

M. Lisfranc as before noticed has used the solution of the chloruret of lime of the strength marking three degrees of the chlorometer of M. Gay, Lussac, in the treatment of atonic and chonic ulcers with decided advantage.

The author has used both the chloruret of lime and that of soda as well in the treatment of common ulcers as in those of long standing, and has found the healing process to advance with greater certainty than under the use of the usual applications. When there is much inflammation the use of the chlorurets produces too much irritation to be proper. Sometimes the solution of the chloruret has been combined with the use of cataplasms; but more generally with common dressings, varying the support afforded to the limb according to circumstances.

However desirable in some cases it may be for patients to afford an ulcerated leg complete rest, yet the inconveniences of such a mode of treatment are very great, and by careful dressing, a very considerable degree of exercise may be permitted without injury. In some of the cases in which I have employed the chlorurets, the patients have been so circumstanced as to be obliged to walk from five to six miles daily, and the healing process has gone on favourably under this disadvantage.

Sometimes in old ulcers the surface is foul, the discharge is thin, acrid, and extremely offensive: in such cases I have observed a decided improvement, even during the first week, under the use of the chloruret of oxide of sodium.

The strength of the application should be regulated so as to avoid giving any considerable pain. From three to six proportions of distilled water to one of the concentrated solution, will suffice for ordinary use; but sometimes its immediate application undiluted when the surface is very foul, may be made not only without injury, but with decided benefit. I have witnessed on several occasions the change from a foul grey surface to a clean florid appearance in twenty-four hours, and the relief to the patient's feelings correspond with the alteration in the appearance; but it is not any sudden improvement, which can supersede the necessity of strict and persevering attention: I have known patients inflict upon themselves by a single awkward application of the roller a degree of injury, which has not been recovered from in the course of a month.

I have at this time under my care a gentleman labouring under ulcer of the leg, who informs me that previously to his coming to town his leg had thrice from a tolerably healthy condition of sore, taken on the sloughing process, and each time after an attempt to expedite the cure by

limb steadily, as a whole, without disturbing the natural position of the parts above and below the fracture. Thus cleanliness may be carried into effect without injury.

When the offensive discharge is permitted to accumulate, and when bones are exposed to pus, the peculiar fœtor is great, the bedding and every thing about the patient soon become tainted, and the atmosphere around him becomes impure and unfit for respiration either in health or disease: under such circumstances can it be surprising that fever so often supervenes, even after the immediate danger from the local injury has subsided?

One of the important precautions in the treatment of compound fractures, is to prevent or to counteract putrescency: this I have effected before I became acquainted with the chlorurets by much less powerful antiseptics, such as vinegar, pyroligneous acid, &c. aided by strict attention to cleanliness, but the power of the chlorurets of lime or of soda, in destroying putrefaction and animal effluvia, is so fully established, no doubt can be entertained that what *may be effected* by the imperfect means stated above, may be much more completely performed by the more powerful and perfectly safe antiseptics, the chlorurets of soda and of lime.

The same precautions which regulate our use of these agents in the treatment of wounds and

whose pecuniary resources may be slender, may be precluded from holding a situation for which he is well qualified, and on whose efficiency the welfare of the patient not unfrequently depends. In a cause so important to humanity, it may become a question, whether, were the situations of house-surgeon, dresser, &c. in our hospitals, instead of being *purchased* by a premium, *conferred* as the reward of merit upon the students who should in a public examination prove themselves the most worthy and competent to perform the duties, a great step would not be gained, both in respect to science and humanity? This is no chimerical proposition: it has for years past been carried into effect in the hospitals of Paris, and great benefits have resulted from the arrangement.

It is not my intention to examine all the circumstances on which the successful treatment of compound fracture depends; but one cause of failure may be traced to the accumulation of putrid discharge on the dressings and bandages, the latter of which are sometimes left about the limb for weeks without being exchanged for clean ones: the motive generally assigned is to avoid the disturbance of the limb; but though it must be injurious to a patient to have the fragments of a bone in a fractured limb moved upon each other, and forced into the softer parts, the objection does not apply to the moving of the

a paralysis of the bladder, and not passing his urine during several weeks otherwise than by overflowing (*par regorgement*) was during some days afflicted with all that series of accidents which succeeds the forced distension of the bladder, the prolonged confinement of the urine in this viscus, and the supposed passage of a part of this liquid into the blood. The hypogastric region was tense and painful; the urine turbid and ammoniacal, deposited a thick brownish and fetid pus; the tongue was dry, the skin harsh, the chest embarrassed, the voice hoarse and feeble: there was much agitation, and sometimes fleeting delirium. M. Ségalas was called: this physician acquired by the catheter the confirmation of the diagnosis established by the symptoms. An elastic gum catheter, introduced with the greatest facility, gave exit to a great quantity of purulent urine of an insupportable odour. The instrument was allowed to remain during two days, but became several times obstructed. Often, in consequence, injections were practised, but with little success; which determined M. Segalas to introduce a catheter with double tube, and to wash the bladder freely with water, according to the ingenious method of *M. Jules Cloquet*.

These means employed for several successive days, had the effect which was expected: the bladder was freed from the influence of the putrid matters which occupied it, the urine passed with

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Prudence requires that this remedy be directed by a professional attendant, who will augment or moderate its action, or even suspend the use of it if needful.

M. Sanson, after having operated upon an enormous uterine polypus, by ligature, in the presence of *Dr. Lefevre*, has seen putrefaction take possession of this extraneous body; he has effected the disinfection by the applications of chlorureted water, and the mortified substance became detached; the operation was followed with success.

In diseases of the uterus and vagina attended with discharges, the chloruret of oxide of sodium properly diluted and used in the form of injection, will be found a valuable auxiliary to such general treatment as may be required. In leucorrhœa the author has employed it with great relief to the patients.

Dr. Elliotson, physician to St. Thomas's Hospital, has used the chloruret in a case of diseased uterus which he had previously considered to be almost hopeless: the patient is now in a fair way of recovery.

In the practice of Midwifery it sometimes happens, whether from any portion of the secundines not being removed or from other cause, that the lochial discharge is kept up beyond the usual period, and becomes so offensive as to taint the bedding, &c. In such cases the patients health

suffers greatly. The injection of a diluted solution of the chloruret of oxide of sodium would at once correct the offensiveness of the discharge, and with proper precautions that the solution be not too strong, nor the menstruum with which it may be combined, so large in quantity nor so low in temperature as to be detrimental, the remedy may be employed with safety and advantage.

Treatment of Burns and Scalds.

M. Labarraque states that M. Lisfranc, surgeon in chief of La Pitié, pursues his brilliant success in the cure of burns and of ordinary ulcers by means of the chlorurets. The memoir which he proposes to publish on this subject, and which he has announced to the Royal Academy of Medicine, will be of the greatest interest.

In addition to the valuable observations of M. Lisfranc on the treatment of burns and scalds, the author begs leave to suggest to surgeons employed for the accidents which happen in collieries, founderies, &c. the use of the chlorurets in the treatment of such accidents, which of late years have unfortunately been too frequent and calamitous in our collieries. In severe burns, the immediate destruction of the vitality of the soft parts is so great, that no expectation can be entertained of restoring their organization, consequently healing can only take place after the

separation of the dead parts, and under such circumstances the healing process is generally very tedious. With the use of the chlorurets the usual attentions, which would be proper when common dressings are applied, should not be omitted.

Various instances in which the use of the Chlorurets has been found beneficial.

Cancer has been disinfected, and experiments are continued on this frightful malady as also on corroding tetters. (Dartres.) Cases of the cure of scald-head have equally been communicated to the Royal Academy of Medicine.*

Herpes. Dr. *Biett*, Physician to the Hospital Saint Louis, has made numerous applications of the chloruret of oxide of sodium to herpetic complaints.

M. Sanson, Surgeon in Ordinary at the Hotel Dieu, has disinfected *ulcerations of the mouth,* with caries of the bones of the vault of the palate, and has suspended during some time, the ravages of this frightful malady.

Dr. Lagneau, has made use of the chloruret in injections for the *softening of the gums, with ulce-*

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* Case of a cure of *tinea favosa*, communicated to the Royal Academy of Medicine, by *Dr. Roche.* This affection had resisted the different usual modes of treatmant.

rations, exhaling a great degree of fetor. The condition of the patient has been ameliorated, and after each injection, the odour has been destroyed.

M. Reynard, dentist, has wished to employ the chloruret of oxide of sodium, to arrest the caries of teeth, and to destroy the odour of the mouth; but he has observed, that this remedy disagreeably excites the salivary glands; and on that account, he thinks it cannot be employed for the toilet of the mouth.

Dr. Chantourelle, has long since employed the chloruret of oxide of sodium, diluted with ten parts of water, in two cases of putrid sore throat, (*angina gangrenosa*,) and all fetid odour, so dangerous to the assistants and to the physician, disappeared: these two cases have been communicated to the Society of Medicine of Paris. Very recently also, he has derived great advantage from the use of the chloruret taken into the stomach, in the dose of twenty-five drops in a glass of water, to destroy the disengagement of sulphureous gas, which, very greatly troubled a person poisoned by the hydrosulphuret of potash, already expelled by vomiting. His memoir, read at the Royal Academy of Medicine, has given rise to a learned report, which is noticed under the head ASPHYXIA.

In *Ptyalism*, and *ulcers of the mouth*, the author has employed the solution of the chloruret of oxide of sodium, with decided benefit; also in

simple and syphilitic ulcers of the throat; in the more severe affections of these parts in that form of angina, commonly called putrid sore throat, the relief has been almost immediate.

In the affections of the throat, in *small pox,* in *measles,* and in *scarlatina,* the use of the chloruret will prove a most valuable auxiliary, although it would not be safe to trust to a local application only to the exclusion of other means, essential to the welfare of the patient.*

In a case of small pox, under the care of Dr. Roe, Physician to the Westminster Hospital, the apthous and sloughy state of the fauces, was such as to occasion considerable anxiety: there was a large slough adhering to the hard palate, and a thick crust covering the tongue, precluded examination of its actual surface. The patient was bled to the approach of deliquium, and general antiphlogistic treatment adopted, with the free use of a gargle of diluted chloruret of oxide of sodium. These measures were begun on the Tuesday, and on the next Saturday, the patient was free from any urgent symptom; the sloughs had separated, and the only ulcerated surface, was that of the tongue, which was nearly healed. The patient speedily recovered.

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* See Observations on the Inflammations of the Mucous Membranes of the Organs of Respiration, by the author of this work, published in the Medical Intelligencer, 1820.

Ozæna has been disinfected by injections made twice a day with the chloruret of oxide of sodium, diluted in from two to ten parts of water, and this fetid ulcer has been cured.

A similar case came under the care of the author, namely, of ulceration within the nostrils, attended with extremely offensive odour: it occurred in a girl employed by her relations to nurse their children. The odour was so intolerable to her friends, that they were fearful in allowing her to remain in the family. She was directed to use a solution of the chloruret of oxide of sodium to the affected parts frequently, by inhaling forcibly when the nostrils were immersed in some of the solution. At first, she used it but very imperfectly, and probably, without reaching the diseased surfaces, but in the course of a few days she managed better, and the offensive odour was no longer perceptible. The application did not produce pain.

The author has employed the solution of the chloruret of oxide of sodium locally, in ophthalmia, gonorrhæa, and some other inflammations of the mucous membranes, with apparent benefit; but as general treatment was combined, except in some slight cases, he does not feel himself warranted to decide, how far the chloruret may be likely to supersede the means in common use.

In the treatment of a case of *punctured wound received in dissection,* the inflammation was pro-

ceeding up the arm with alarming rapidity, and the pain and tension were extreme: the patient experienced immediate relief from the diluted chloruret of oxide of sodium, used as a lotion, combined with the free use of leeches: rest and abstinence were considered to be essential, and were strictly attended to. The patient recovered without any untoward circumstance.

In *sinuous ulcers, connected with diseased joints,* the benefit derived from the injection of diluted solution of the chloruret has been very obvious. The fœtor attending the exfoliation of portions of bone has been thus corrected, and the sinuses have soon become consolidated, after the exfoliation has taken place. In one case of diseased ancle, in which the chloruret, in conjunction with other remedies, was used; the patient had quitted an hospital, because he would not submit to amputation, which had been strongly urged: anchylosis of the ancle joint had taken place; but the extent of motion subsequently acquired in the articulations of the tarsal and metatarsal bones, enabled him to walk with a degree of freedom that could not have been anticipated.

In another case of diseased elbow joint, (the patient a boy of scrophulous diathesis,) repeated abscesses and sinuses formed around the joint, which was greatly enlarged. For many months the total immobility of the forearm upon the arm, rendered it probable that anchylosis might be the

most favourable result that could be obtained: in addition to the careful employment of the usual means of treatment, the solution of the chloruret was conjoined, both as lotion and injection: great care was taken to improve his general health: fortunately, these means have been so far successful, that he has regained a considerable degree of motion in the joint, his general health is greatly improved, and there remains but little enlargement, and only two superficial ulcers. The progress of this and the preceding case, was observed by Dr. Filkin, and other professional friends.

On the use of the Chlorurets in the treatment of of Asphyxia, and in cases of Poisoning by the Sulphurets of Potash and Soda.

The researches and experiments very recently made by M. Laurens, Professor of Chemistry and Pharmacy, at the Secondary School of Medicine at Marseilles, have shewn, that the chloruret of lime possesses the property of neutralizing the deleterious effects of carbonic acid. Birds, which had been reduced to a state of asphyxia, by means of this acid within a bell-glass, were brought to life the moment that M. Laurens caused a small quantity of this chloruret to be introduced under the bell-glass, which was placed over a mercurial trough. This distinguished chemist, having been afterwards afflicted with a violent head-ache, by

the vicinity of a pan containing charcoal recently lighted, was suddenly relieved from it, by respiring (the vapour of) chloruret of lime. These two curious facts, indicate to us new applications, which had remained hitherto unperceived, of the invention of the celebrated and beneficent M. Labarraque, in relation to medicine and domestic economy. Thus we may now employ the chlorurets with advantage, in the kitchens of citizens, in the workshops or places where ironing of fine linen is performed, and in all confined and badly aired places, where the privation of a sparkling fire, as among the poor, leads to the use of charcoal. *(Guide Sanitaire, p. 804.)*

At the sitting of the Royal Academy of Medicine of the 24th May 1825, Dr. *Chantourelle* read a memoir on the action of the *sulphurets of potash and soda*, containing two cases of poisoning by these substances. In the one of these cases an ounce and a half of sulphuret of soda swallowed produced only an inflammation of the stomach which was not mortal. Mucilaginous drinks taken in great abundance to induce vomiting of the poison, and the addition in each cup of these drinks of a table spoonful of the solution of the chloruret of oxide of sodium of M. Labarraque, to decompose it, were the means at first employed; afterwards the inflammation of the stomach and intestines was combated by the usual antiphlogistics.

In the other case four drams of the sulphuret of potash swallowed produced so sudden and abundant a disengagement of sulphureted hydrogen gas, that the patient immediately perished by asphyxia, and without the poison having time to produce its corrosive and inflammatory action upon the stomach and the other digestive organs. From these two facts Dr. Chantourelle concludes that the sulphurets are at the same time escharotic and suffocating poisons, and that in the appreciation of the symptoms which result from swallowing them, as in the choice of the means to oppose them, regard must be had to these two kinds of effect. (*Archives* T. VIII. p. 284.)

At the Royal Academy of Medicine, Section of Medicine, July 12, 1825, Messrs. Burdin, Husson and Ferrus made a report on these two cases. The reporters agree with Dr. Chantourelle that the sulphurets kill, sometimes by producing asphyxia when there is a rapid disengagement of sulphureted hydrogen gas, and at other times by exciting a strong inflammation of the stomach and intestines. The reporters proceed to give some details of the uses which have been made of the chloruret by M. Labarraque and others.

A discussion followed in which in answer to a question by M. Marc, whether when the sulphuret of soda kills quickly it is not by its caustic effects, M. Orfila answered that in these cases it is certainly the liberation of the sulphureted

hydrogen gas which causes death: and he gave as a proof that sulphur is then always found in the stomach; and it is only thus that the chloruret of oxide of sodium is useful in destroying the gas which produces asphyxia. M. Caventou remarked that it is long since chlorine has been employed, not only to neutralise sulphureted hydrogen gas but also as an antidote against poisonings by this gas. M. Orfila replied, that, as the respiration of chlorine often produced accidents, it was an advance in science to have thought of employing the chloruret of oxide of sodium. (*Archives* T. VIII. p. 603.)

An interesting case of Asphyxia, successfully treated by M. Labarraque, is related in the eighth volume of the *Archives*. Mr. L. had read the particulars to the Society of Medicine. It occurred in August, 1824.

A workman of a vermicelli maker was exposed to a current of deleterious gas, which proceeded from an accumulation of filth and rubbish heaped together from a pit of night-soil which was undergoing repair. He fell without consciousness. M. Labarraque was called to the patient soon after the accident, the symptoms were; pulse strong, but fugitive on pressure, excessive rigidity of the limbs; arms stretched, stiff and almost cold; head thrown backwards; veins of the neck turgid: face violet coloured, also the lips, which were much swollen; eyes closed, dull and insen-

sible; respiration appeared extinct; the danger seemed imminent. The physician did not arrive; vinegar, æther, and strong ammonia placed under the patient's nostrils produced no effect. The sensibility could not be recalled. M. Labarraque details the train of reasoning which led him to adopt immediately the concentrated solution of the chloruret of oxide of sodium. A napkin moistened in the solution was placed under the patient's nostrils and in less than one minute he uttered an acute and plaintive cry or groan: the rigidity ceased; his eyes opened to shut again in a few seconds: the tetanic rigidity had reappeared with its frightful train. I (Mr. L.) had withdrawn the chloruret too soon. The usual stimulants again tried produced no effect. The chloruret was reapplied: in less than a minute the rigidity of the limbs ceased and the patient sent forth a piercing cry, which was stopped by the linen impregnated with the chloruret. A full inspiration took place, the air necessarily passing through the moistened linen, was therefore charged with chloruret saturated with water. The disinfection of the gas contained in the chest was no doubt complete, since the symptoms ceased. He was made to walk into the street, keeping the chloruret under his nostrils. His countenance regained its natural appearance. Two spoonfuls of an æthereal potion were administered and he was soon in a condition to resume his work; but

this was not deemed prudent after so severe a shock. Repose and the open air were prescribed.

The patient's name was *Jean Deliau*. He recovered his health as perfectly as before the accident.

Another case of Asphyxia, very similar in its cause, treatment and fortunate result, has been related in a former part of this work. (Page 42.)

On the internal use of the Chloruret of Soda.

Of the internal use of the chloruret of oxide of sodium, little information has yet been communicated to the public, and it is probable that its value as an internal remedy, remains in a great measure, to be ascertained.

The use made of it by M. Jules Cloquet and Dr. Chantourelle, as well as that recommended by the Sanitary Council of Marseilles to patients labouring under plague or infectious fevers, may suffice to remove all fears of its safety, when properly administered, as an internal remedy. The author has employed it in erysipelas and in some disordered states of the stomach with beneficial effects; but he considers it of more importance to science and to humanity to direct the attention of his professional brethren to the investigation of its antiseptic properties as an internal remedy, rather than to dwell upon the very little at present known respecting it.

General Observations on some of the uses of the Chloruret of Oxide of Sodium.

"M. Labaraque observes, (*De l'Emploi des Chlorures, &c.*) that the formula which he has published in his memoir (what memoir he alludes to is not specified) ought to be exactly followed in the preparation of the chloruret of the oxide of sodium, for if the formula be deviated from, the properties of the product are changed and its action may be *null:* whilst if the chloruret possess all its properties we are certain of *always obtaining* the effects related in his notice.

M. L. further observes, judicious practitioners after having read his preceding observations, have been able to appreciate the cases in which the application of the chloruret of oxide of sodium ought to be followed by a happy result, and thus to enlarge the domain of therapeutics, by indicating with precision the affections which require its use; that it would be fastidious to name all the justly celebrated physicians and surgeons who have studied the action of the alkaline and earthy chlorurets; but he (Mr. L.) cannot avoid pointing out to the friends of humanity, *Dr. Biett*, physician to the Hospital Saint Louis; *M. Jules Cloquet*, adjoint surgeon in chief of the same hospital; Professor *Marjolin*, surgeon in chief of the Hospital Beaujon; *Dr. Ségalas*, associated professor at the Faculty of Medicine; *M. Sanson*, surgeon in ordinary at the Hotel Dieu; *Dr. Lefevre*, *Dr. Lagneau*, *M. Lisfranc*, surgeon in chief of La Pitié, and others.

In general we may deduce from all that has been observed in the use of the chloruret of oxide of sodium on man, that this liquor is calculated to destroy the fœtor of wounds, to change their nature, and to alter their condition to that of simple wounds; that it is especially efficacious in atonic ulcers, the sloughing sores of hospitals,

gangrene, &c. &c. It may be employed pure or diluted with one, two, or even to eight parts of water: it may be used in the form of lotion, and we are careful to cover the wounds by means of dossils of lint moistened with this liquor. The dressing is performed twice a day: we ought to leave off using it whilst the wound is red and inflamed, and the dressing is made in this case according to the attentions prescribed in treatises on surgery.

Mr. L. further observes, I might multiply these citations infinitely, either in relating the facts of the medicinal applications of the chlorurets in France and the Colonies, or in reporting the authentic disinfections performed under our inspection, or that which has been made at St. Domingo, by order of the Government of that country, and of which the *procès verbal* is inserted in the *Gazette officielle* of 20 Feb. 1825: but this would be travelling beyond the limits of this notice, which ought only to be considered as the extract of a more extended work, in which I shall endeavour to demonstrate the causes and the phenomena of the putrefaction of animal substances, followed by the mode of arresting this disorganizing process under different circumstances."

On the use of the Chlorurets in Veterinary Surgery.

The following statements by eminent veterinary surgeons in France, furnish valuable evidence of the assistance which this branch of surgery may derive from the judicious use of the chlorurets. The laudable exertions made by those in our own country to raise veterinary surgery to the rank of a science will no doubt lead them to give a fair trial to a remedy which seems to have been equally beneficial in some of the destructive diseases of cattle, as it has been proved to be useful in many of the most dangerous diseases incidental to man.

M. Labaraque observes:

"The fatal disease of cattle which has prevailed for several months amongst horses has furnished me the opportunity of proving the effects of the chloruret of oxide of sodium on the carbuncular affections with which these animals are very often attacked. We may judge of these effects by the note which *M. Bouley, Jun.* veterinary surgeon, has caused to be inserted in the *Recueil de Médecine Vétérinaire,* June 1825, and which I think it useful to relate entire."

Note on the Use of the Chloruret of Oxide of Sodium in the treatment of gangrenous tumours, by M. Bouley, Jun.

"All the veterinary surgeons who have employed setons in the treatment of horses attacked by the epizootic disease have

been enabled to remark that these means were almost always useless and often dangerous; I have, in my own practice, observed eight carbunculous tumours which have been the result of their application. Five of the animals which were affected with them have died, the three others have been cured. The first five have been treated by cauterization, and by antiseptics internally; and the three others by the same means and the use of the chloruret of oxide of sodium of *M. Labarraque.*

"The happy effects which I have obtained from this remedy, determine me to make it known, with some details of the circumstances under which I have employed it, and the results which it has produced.

"*Case the First.* The thirty-first of last March, a bay-horse, aged five years, belonging to the Count d' *Yssy*, was attacked with the prevailing disease. A rational treatment was used, to combat this affection, which did not present any alarming symptoms till the fifth day, when a considerable tumour, but little painful, manifested itself, (about the breast,) in the very place where two setons had been placed some days previously, and took on, in a short time, all the characters of carbuncle. I hastened to suppress the setons, and at the same time, caused from twelve to fifteen points of the actual cautery to penetrate into the swelling, and I prescribed the extract of gentian and camphor, in convenient proportions. These means did not produce the effect which I expected, and in the course of the night, between the fifth and sixth day, the disease made rapid progress: *(new cauterization, same treatment.)* At length, the seventh day, the tumour, which had become enlarged, discharged a sanious, fetid humour, of a peculiar odour, which left no doubt of the existence of gangrene; the prostration of strength was carrid to its height, and every thing announced a very speedy and fatal termination. Such was the almost desperate state of this animal, when *Dr. Ségalas* saw it, and advised me to employ the chloruret of oxide of sodium of *M. Labarraque*, assuring me that he had obtained from it marvellous effects on man, in a similar case. I hastened to profit by the advice of this learned physician, and I immediately caused injections of the chloruret to be made into the openings made by the actual cautery: these injections were practised every hour, and the

wounds dressed immediately afterwards, by means of cut tow; I also caused frequent aspersions of the same liquor, diluted with five or six parts of water, to be made in the stable.

Calculating from the moment when I employed the chloruret of oxide of sodium, the tumour no longer made any sensible progress, and the disagreeable odour which it exhaled, partly disappeared. From the fourth to the fifth day, the eschars began to fall off, suppuration was established, and all danger ceased; in fine, the considerable wound, which resulted from the falling off of the gangrenous parts, cicatrized speedily, and in less than a month, this animal was in a condition to resume its usual work.

"*Second and Third Cases.* Two horses out of age, belonging the one to *M. Ingé*, butcher in Paris, the other to *M. Renoult*, cultivator at Yvry, were affected with the prevalent disease in the course of May, and both suffered the same accident as the preceding, in consequence of the applications of setons. These two animals were treated, and cured by the same means, in the space of twenty or twenty-five days.

"I do not pretend that the chloruret of oxide of sodium is a panacea against gangrenous tumours, neither do I believe that this medicine alone can suffice; but I believe that this remedy is a powerful auxiliary, and I am authorized by facts to believe so, since the first five horses which I have treated solely by the cauterization and tonics died; whilst those which have been submitted to the action of the chloruret have been cured."

M. Chanas, Veterinary Surgeon to the Gendarmerie of Paris, made a deep and very extensive incision on each side of the neck of a horse, upon a carbunculous tumour, which in a few hours had increased considerably, and which afforded no sign of sensibility. He then caused tow moistened with concentrated chloruret to be placed upon the incisions. At the end of four hours, the animal suffered pain. The dressing with the same liquor, was made morning and evening, during five days, the tumefaction has diminished progressively, the cicatrix formed in a short time, and the horse was cured. Messrs. *Dupuy*, *Girard*, *Jun.* and *Vatel*, Professors at the School of Alfort and *Berger*, Veterinary Surgeon to the Gardes du Corps,

have likewise proved the properties of the chloruret in these affections.

M. *Dard*, a young veterinary surgeon, has written to me on the 17th July, 1825, "the good effects which I have obtained from the chloruret of oxide of sodium in several cases, and particularly in the treatment of a glandered horse, which at present is in complete cure, induced me to repeat this remedy upon another horse affected with a disease almost equally intractable, the farcy." I relate this fragment of letter to invite medical men to make experiments.

Instructions for disinfecting and purifying the stables of the Gardes du Corps du Roi, and of the Gendarmerie of Paris have been arranged. (See page 34.) There is cause for congratulation that they have been followed exactly. The disease has ceased its ravages. A great number of proprietors have likewise obtained good effects from the use of chloruret of oxide of sodium to purify their stables, and ox-stalls and sheep folds. M. *Girard*, formerly professor and director of the school of Alfort, in the third edition of his *Notice sur la maladie qui règne épizootiquement sur les chevaux*, has thought it useful to print these instructions, which he has introduced by a note thus expressed:—

"This liquor, employed with advantage by Messrs. *Bouley* jun. and *Vatel*, destroys quickly the fetid odour which the tumours exhale, facilitates the falling off of the eschars, and appears to be a powerful antiseptic. We think it right to place here a note of M. *Labarraque*, who first proposed the use of this remedy, already advantageously known in medicine." (See page 34.)

It would be vain to expect success under all circumstances from any remedy, whether applied to men or to the lower animals, more particularly should it happen that whatever might be the appropriate general treatment, neither that nor the quality of the preparation used should have excited attention; *M. Girard* mentioned at the sitting of the Royal Academy of Medicine of the

5th July, 1825, that he had vainly applied this remedy upon a horse which had a gangrene of the tail; but the disease continued to make progress. M. G. does not mention any further particulars.

It is probable that should the same application be used in a case of *gangrena senilis* of the human body, arising from exhaustion or constitutional cause, no other result could be expected from any local remedy, than that the disease should advance.

On the preparation of the Chlorurets.

M. Labarraque, in a note read to the Society of Medical Chemistry, the 13th March, 1826, observes:

"When a therapeutic agent comes into general use, it is indispensable to regulate its mode of preparation, that the substance may be identical every where. He desires that these formulæ may produce this effect. The first (the chloruret of oxide of sodium,—*chlorure d'oxide de sodium*,) is especially employed in topical and external application to wounds and ulcers affected with hospital gangrene, or of which the character is gangrenous; the other (the chloruret of oxide of calcium,—*chlorure d'oxide de calcium*, or simply expressed, chloruret of lime), serves for the disinfection of amphitheatres, of sick wards, and of all places become unhealthy by the presence of putrefied animal matters.

Chloruret of Oxide of Sodium.

Pure carbonate of soda* .	2½ kilogrammes
Distilled Water . .	10 kil.

* The sub-carbonate of the London Pharmacopœia.

Mix, and assure yourself, that the liquor marks twelve degrees by the areometer (pèse-sel) of Baumé. If the liquor be too concentrated, which might happen if the salt have effloresced, add the necessary quantity of water to bring it to the degree indicated. If, on the contrary, the solution be too weak, a sufficient quantity of the carbonate of soda must be added.

If the carbonate of soda constantly retained the same quantity of water, it would only be necessary to fix the precise doses; but this salt is far from being at all times identical.

The liquor is put into a vessel of sufficient capacity that about one fourth may remain empty.

We dispose upon a sand bath, a glass balloon of four pints, with long neck and wide mouth, into which the following mixture is to be introduced.

Hydrochlorate of Soda (common salt)....576 grammes
Peroxide of Manganese, in powder* ....448 grammes

To the opening of the balloon, is luted a large bent tube, and an S tube, for the introduction of the diluted acid. The first tube dips into a vessel containing a small quantity of water, and from this same vessel, a large bent tube proceeds to, and dips into the flagon or vessel containing the saline solution.

The apparatus being conveniently disposed and the lutes well dried, the diluted acid, cold and mixed some hours previously with the water, is poured through the S tube, in the following proportions:

Concentrated sulphuric acid 676 grammes
Water . . . . . 448 grammes

The fire is applied under the sand bath, and is directed gradually, till the disengagement of the chlorine ceases.

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* The quantity of peroxide of manganese, would be too considerable, if this substance were always found of the first quality in commerce. Its excess does not in any case seem to be hurtful.

The operation terminated, the apparatus is unluted, and the discolouring or bleaching power of the product is examined.* For this purpose one part of the chloruret is introduced into the *berthollimeter*† and a solution of indigo is poured upon it, prepared as follows :

Bengal Indigo powdered . . .	1 part
Concentrated sulphuric acid . . .	6 parts

Apply heat, and afterwards dilute with 993 parts of distilled water.

The chloruret ought to discharge eighteen parts of sulphate of indigo. It is essential to make two or three proofs of discoloration.

After the first, which is made by feeling one's way, the second ought to be made briskly, by adding at once the whole quantity of the solution of sulphate of indigo, which the preceding proof had required to arrive at a deep green. In acting promptly the discoloration is more decided (as observed by M. M. Gay-Lussac and Welter ;) which obliges us to make a third proof, after having added some parts of the sulphate of indigo to the second, to arrive at the green colour, and in keeping account of this addition in the last experiment, which is the most conclusive.

If the solution of carbonate of soda be not sufficiently saturated with chlorine, a current of this gas should be again passed through it, to bring it to the fixed point.

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* It might save much inconvenience either to have a stop cock at the bottom of the vessel, or to withdraw, by a tube passed through the safety tube, a portion of the solution for the purpose of examination, before the apparatus be unluted. If the tube conveying the chlorine do not pass sufficiently near to the bottom of the alkaline solution, the upper part may be fully impregnated, whilst the lower portion of the liquid may not be of the required strength. This remark has been verified by Mr. Morson, who has paid considerable attention to the preparation of this chloruret: his apparatus is furnished with stopcocks, by which a portion of the preparation may be withdrawn for examination at any period during the process—Ed.

† A simple graduated tube or measure will answer the purpose.—Ed.

M. Labarraque adds, that he has here entered into superfluous details for the instructed apothecary, but although minute for practised chemists, these details have appeared to M. L. indispensable in the preparation of a medicament, which till very lately had not been employed in medicine. He recommends that the preceding process should be followed to the letter, so as to obtain always an identical product, and thereby the same beneficial results; for it is known that in the preparation of certain medicaments, the mode of preparing them modifies their external characters and even their virtues.*

Chloruret of Oxide of Calcium.
(Chloruret of Lime).

The process by which M. Labarraque makes this preparation is as follows:

Caustic lime is sprinkled with a small quantity of water, and allowed to slake completely. This damp powder is mixed with one twentieth part of hydro-chlorate of soda, and put into vessels of earthen ware of an elongated form, into which the chlorine arrives. This gas is disengaged from a mixture similar to that employed to prepare the chloruret of oxide of sodium. Several apparatus are placed by the side of each other, according to need, always being careful that the chlorine arrives slowly into each of them, so that the combination

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* Mr. L. further adds, "I hope to be pardoned for this solicitude, when it is with this product as it is with all the produce of the hands of men, nothing is perfect. Very clever chemists, thinking perhaps that advantageous modifications might be made in this process, have made chlorurets which have not produced the same effects as those which I had caused to be tried. Nevertheless, I have not made any mystery respecting it, I have described the process with all the care of which I am capable; but it is impossible that this description should supply the habit of making it on a large scale, and of often performing the same operation."

The author deems it simply an act of justice to M. Labarraque to state that he has found the chlorurets, obtained from Mr. L. at different times, very uniform in strength, and possessing the same medicinal properties.

may be made successively. This condition is essential to the success of the operation.

The hydrated lime, being sufficiently charged with chlorine, becomes moist, and on this phenomenon we are aware that the operation draws near to a close.

To assay its point of saturation, one part of this chloruret is diffused in one hundred and thirty parts of water, and this solution ought to destroy the colour of four parts and a half of sulphate of indigo.

Mr. L. observes, the chlorometer of the celebrated Gay-Lussac (described in another part of this work) is much more exact; and it is of this instrument that we ought to avail ourselves to examine this chloruret, if we wish to employ it for degenerated burns, as M. Lisfranc has done with success.

For disinfections, the essential point is to saturate the mixture with chlorine, and the purity of the bases is less necessary for chloruret for this purpose than for that which is employed upon living beings.

In considerable establishments, such as hospitals, &c. where daily disinfections may be required, we may make liquid chloruret of lime, and the following is the process:

Put into forty litres of water half a kilogramme of hydrochlorate of soda, and one and a half kilogramme of slaked *quick* lime; a tube must be conducted to within a few inches of the bottom of this liquid, (which must be stirred with a wooden spatula), to conduct the chlorine disengaged from a mixture which may be one half less considerable than that which has been indicated to obtain the chloruret of oxide of sodium: the discolouring property of this liquid chloruret must be tested; it will be too strong for the disinfection of the wards and of putrid animal substances; it must be diluted with a sufficient quantity of water, and may be used for sprinklings."

Such are the directions of M. Labarraque. The apparatus is essentially that of Woulf.

To those in the country who may not be able to procure the chlorurets without inconvenience,

it may be useful to suggest that these preparations may be made with sufficient accuracy for disinfection, by means of a sand bath, (which may be a common flower pot filled with sand) a few wide-mouthed bottles, and bent tubes, made either of lead or glass, without any expensive apparatus. The greatest inconvenience to be guarded against, is the escape of the chlorine gas, which is very irritating and even dangerous if respired in considerable quantity. The tubes should be passed through corks or bungs fitted to the mouths of the vessels and any deficiencies corrected by common luting, a resinous cement, or even by stiff glazier's putty. Should any of the chlorine escape, it may be rendered harmless by sprinkling freely, hartshorn, or other ammonical solution, which rapidly absorbs and reunites with the chlorine. In making the chloruret of soda, it will be found convenient to pass a tube from the last vessel, to another containing cream of lime, which will absorb the superfluous gas; which might otherwise escape into the apartment.

From the trifling cost at which these articles can be manufactured on the large scale, when compared with the valuable uses to which they may be applied, advantages which would be freely purchased at any cost, by those capable of appreciating them; it is not very probable that the chlorurets may be made on a small scale, except for the purposes of experiment.

It cannot be uninteresting to the reader, to peruse the following statement of a manufactory perhaps unequalled throughout the world, and equally creditable to the enterprise of the highly meritorious individual to whom it belongs, as to the useful arts of this kingdom. The statement is copied from the American Journal of Science and Arts, (Vol. x. No. 2, February 1826), and was communicated to the editor of that journal, by an American gentleman, dated Glasgow, Nov. 25, 1825.

"*Bleaching Powder, Sulphuric Acid, Alkalies, &c.*

"I was much interested in the manufactory of Mr. Charles Tennant, near this town, whose personal liberality and intelligence are not less gratifying than the results of his ingenuity. The original object was the manufacture of the bleaching powder, now so extensively used: but he has combined several others with it, in a manner which materially contributes to the success and profit of the whole. The buildings of the establishment, cover a space of five or six acres. One large section is devoted to the manufacture of sulphuric acid. The nitre, instead of being combined with the sulphur in this operation, is placed in a separate portion of the furnace, and its gas is evolved by the heat of the burning sulphur. There are thirty furnaces, and an equal number of leaden chambers, seventy feet in length, twenty in breadth, and sixteen in height, for the condensation of the acid, which appear as if they were competent for lodging the inhabitants of a village. A large part of this acid is employed in the production of chlorine for the use of the manufactory, and is therefore condensed only to the degree necessary for this process. The remainder is rectified by distillation in platina retorts. There are nine of these vessels, holding fifty gallons each, and weighing five hundred

or six hundred ounces. Their value cannot be estimated at less than 2,500 (dollars) each; or 22,500 (dollars) for the whole; and yet it is believed to be more economical than to employ the perishable vessels of lead. Mr. Tennant informed me, that they appear to suffer no diminution or decay, but are liable to bend and break from the intensity and continuance of the heat. The whole produce of sulphuric acid is about 12,000 gallons weekly.

"The next process in order, is the formation of the chlorate (CHLORIDE, ED.) of lime. There are fifteen or twenty leaden retorts for the evolution of the chlorine, about five feet in diameter, and weighing nearly three tons each. They are heated by steam, and the usual materials are employed for the production of the gas. Within two years, the inconvenient apparatus formerly employed for the impregnation of the lime, has been greatly improved by the ingenuity of M. Tennant. The gas from the retorts, is passed into six chambers of hewn stone, about thirty feet long, twenty wide, and six high, which are covered with wood, and rendered impervious to the gas, by a resinous varnish. The lime is placed in shallow boxes at the bottom of these chambers. It is agitated during the process by iron rakes, inserted through a box filled with lime which serves as a valve. The impregnation is generally completed in two days, when the supply is renewed by means of wooden doors which are luted in. So accurately is every part of the apparatus fitted, that in the building containing these immense volumes of imprisoned gas, there was no disagreeable vapour, and the gas was not so perceptible as it usually is in a laboratory where a small quantity is forming for mere experiment. The powder, when completely formed, even in large quantities, has no perceptible odour, and thus shows the accurate manner in which the process is conducted.

"The remainder of the establishment is employed in turning the residue of these processes to account, the sulphates of soda and potash are converted into the alkaline state, by two successive burnings, in union with bituminous coal, and three lixiviations and evaporations. About eighteen tons of subcarbonate of soda in its purified state are produced weekly. By two successive crystallizations it is formed into large rhom-

boidal tabular crystals, and surpasses in beauty, any specimens of the article I have ever seen produced in the large way. A part of the alkali is taken at an intermediate state, and employed in the last section of the manufactory, in the making of soap. It furnishes the chief supply of this article for this city, and the surrounding country. Some idea may be formed of the extent of this establishment, from the fact that it requires a daily supply of sixty tons of coal, and twenty tons of lime, and the completeness of the parts is quite as surprising as the magnitude of the whole. It is only doing justice to the proprietor to state that it is the result of individual enterprise and ingenuity, operating at first on a small scale."

In the *Journal de Chimie Médicale*, for November, 1826, M. Payen has furnished an article *On the preparation of the Medicinal Chloruret of Soda*, (a very appropriate name for the article, and less liable to objection than most of its synonymous terms,) which is creditable to its author as well for the analyses which he has made of the relative strength of the chlorurets of lime and of soda, as the candid and handsome manner in which he has submitted his observations "to the enlightened philanthropist who has concecrated the use of one of the most useful therapeutical agents."

The chief of his objections to the formula of M. Labarraque apply rather to the probable errors that may be committed by deviating from Mr. L's directions than by following them. Two or three seem valid as relating to Mr. L's process, namely, the difficulty of regulating the heat of a sand bath; and the varying quality of indigo by which the product is examined; and the excess of alkali beyond that which combines to form a neutral chloruret. The former of these difficulties may be easily obviated by substituting a water bath, or steam, for the sand bath; and the chlorometer of M. Gay-Lussac, which M. Labarraque points out to be more exact than the simple method of testing the product which he describes, enables the chemist to arrive at sufficiently accurate results by indigo of any quality, a definite quantity of chlorine gas being the standard of comparison. M. Payen's objections apart from technicalities, amount to this: that a description, however exact, cannot

confer intellect, adroitness or dexterity upon those who have never paid the price of observation, study and labour, by which alone skill can be purchased; and therefore—they will blunder.

The following formula for the preparation of the Medicinal Chloruret of Soda is recommended by M. Payen, on account of its extreme simplicity: he states that it has received the sanction of experience, by trials of its application to the living body; but Mr. P. is silent as to the number of instances or the nature of the diseases in which it was used.

Chloruret of Lime at 98° of Gay-Lussac's Chlorometer	500 grammes.
Christallized subcarbonate of Soda .	1000
Water	9000
.... Produce about ten litres of Chloruret of Soda.	

To prepare a neutral chloruret by the same process, it will suffice to use 690 grammes of subcarbonate of soda instead of 1000.

Dissolve the chloruret of lime by diffusing it by means of a plunger, in six kilogrammes of water added successively in small portions: leave it to subside for three hours and draw off the clear liquid, which is to be filtered; pour the deposit upon the same filter, and wash it with a kilogramme of water added at eight successive times.

Dissolve the subcarbonate of soda with heat in two kilogrammes of water; allow it to cool and mix together the clear solutions: an abundant precipitate is formed which may be left to subside for some hours (if in haste the filtration may be performed immediately); the clear liquor is separated by filtering as it flows: the deposit is added upon one or more of the strainers, and when it no longer affords drops, the whole of the clear solution is bottled, corked hermetically and sealed.

The deposits are of a brilliant white, washed with lotions of water which carry off the last portions of the liquid it contained; the weak solutions which result are employed instead of water to dissolve the chloruret of lime for subsequent use.

The chloruret thus produced Mr. P. states to be of the same strength and properties as the chloruret of oxide of sodium of M. Labarraque.

The length to which the preceding articles have extended prevents the addition of many details, which, though interesting as they relate to a new remedy, are not essential either to its manufacture or medicinal use.

Baumé's Areometer, pèse-sel or pèse-liquer. (See PLATE, A and B.)

This instrument is simply a hydrometer for ascertaining the specific gravities of liquids heavier than water. The zero marks the depth to which the stem sinks in distilled water: the principal divisions of the scale are ascertained by immersing the instrument in saline solutions of definite proportions. Thus to mark 15 upon the scale, we should dissolve 15 parts of very pure and dry sea salt in eighty-five parts of water forming 100 parts of liquid: the depth to which the stem sinks is the point required: the division of the space from 0 to 15 affords the units. The temperature of the liquid used for graduating the scale should be marked and the same temperature be observed when liquids are to be examined by the instrument. Tables of equivalents are contained in most elementary works on Chemistry Twelve degrees are equal to the specific gravity 1,089.

Chlorometer of M. Gay-Lussac.

The description of the Chlorometer of M. Gay Lussac and the mode of using it subjoined are from the *Annals of Philosophy*, New Series, Vol. VIII. The original may be found in the *Annales de Chimie*, and also separately published at Paris, 1824, under the title of "*Instruction sur l'Essai du Chlorure de Chaux; par M. Gay-Lussac.*"

In the very able translation by Mr. Children, contained in the Annals of Philosophy, the table of the relative value of the various qualities of oxide of Manganese, from analyses by M. Berthier, is omitted: to the manufacturer on a large scale, this knowledge may be of some moment; as the difference between the product of chlorine furnished by one kilogramme of pure

manganese and the lowest on the list is as o^k, 7964 to o^k, 2789.

The terms *chlorure*, *chloruret*, and *chloride*, are synonimous.

Instructions for the Assay of Chloride of Lime.

By M. Gay-Lussac.

"The uncertainty which has hitherto existed in the modes of ascertaining the quality, and consequently the commercial value of chloride of lime, and in no small degree retarded its coming into general use, has determined me to publish the following instructions on the subject. I shall divide the work into two parts; in the first I shall expose the principles on which the assay of the chloride of lime is founded, and in the second I shall describe the instrument which I call a *Chlorometer*, and the manipulations necessary for making the assay with sufficient accuracy for the purposes of those arts in which chlorine is employed.

PART I.

Principles on which the Assay of Chloride of Lime by means of Indigo is founded.

It is known that chlorine destroys vegetable colours, by forming new compounds with their component principles. It is in consequence of this property which it possesses, whether in the state of gas, in solution in water, or in combination with an alcali, that it is employed in the arts of bleaching, calico printing, &c. The same quantity of chlorine, in either of those three states, destroys the same quantity of colouring matter; and since by combination with an alcali, it becomes fixed, has scarcely any smell, keeps better, is more portable, and more capable of concentration, the advantages of preparing it in that form are obvious.

Caustic potash, soda and lime, and even their carbonates, combine very readily with chlorine. Its combination with the potash, or soda of commerce, has long been known in France by the name of *eau de javelle;* that with lime was called oxymuriate of lime; but it is more accurate to denominate the first, as is now

* From the Annales de Chimie.

generally done, chloride of potash or soda, and the latter chloride of lime.

The chlorides of potash, soda, and lime, have very little stability of composition; the two first, indeed, can only be obtained in the liquid state, in a large quantity of water. If, for instance, we pass chlorine into a concentrated solution of potash, at first chloride of potash will be formed; but this chloride will soon be decomposed, and converted into *chlorate of potash*, and *chloride of potassium*. The two latter compounds, not having the property of destroying colours, must be avoided. and the only means of preventing their formation is to employ a very weak solution of the alcali, which, at most, should not exceed the proportion of 125 grammes to a litre of water. (In round numbers, about 4½ oz. potash to 2¼ pints of water.)

Lime has not, like potash and soda, the inconvenience of converting the chlorine into chloric acid; it may consequently be combined with the chlorine *en masse*.

Lime, if perfectly dry, does not absorb chlorine, but it combines with it rapidly when in the state of hydrate, that is, after it has imbibed a sufficient quantity of water from a moist atmosphere, to split and fall to powder. Supposing it to be in the state of hydrate, it forms, according to M. Welter, a sub-chloride only, which is composed of*

2 proportions of lime	=	2	×	35.603	=	71.206
2 water	=	2	×	11.2435	=	22.487
1 chlorine					=	44.2653
						137.9583

* Sub-chloride of lime, according to Mr. Dalton, is constituted of

Chlorine	23
Lime	38
Water	39
	100

Dr. Henry supposes it altered, to correct defects in the analysis.

Chlorine	24·36	=	1 atom	36
Lime	38·54	=	2 atoms	56
Water	37·10	=	6 atoms	54
	100.			146

(Ed.)

When mixed with water it is immediately decomposed; one half of the lime is precipitated, and the other half remains in solution, combined with the whole of the chlorine, and consequently forming a neutral chloride. Hence there are two combinations of chlorine with lime, a sub-chloride, and a neutral chloride. The sub-chloride is obtained by saturating hydrate of lime with chlorine, and the neutral chloride by dissolving the sub-chloride in water, or by saturating lime, dispersed through water, with chlorine.

The neutral chloride, or more simply the chloride, is very soluble; it may, however, be made to crystallize in small prisms. Its solution, left in contact with the air, is gradually decomposed, one part of the lime combines with the carbonic acid of the atmosphere, whilst its chlorine is disengaged. This decomposition of the chloride is retarded by constantly keeping an excess of lime in the solution. From these properties of the chloride, the advantage of manufacturing the sub-chloride only is obvious; its preservation and transport are much more easily effected.

The quantity of chlorine in combination with water, or a base, may be estimated by several processes; but in the arts, in which dispatch is important, the preference has been given to M. Descroizilles' process, founded on the property of chlorine to discolour indigo. One part of indigo dissolved in nine parts of concentrated sulphuric acid, and then diluted with 990 parts of water, forms the coloured liquid usually employed to ascertain the quality of the chlorine.

Under the same circumstances, chloride of lime discolours a quantity of this solution proportionate to its own; but if they vary, the results also are very variable. Thus, if we pour the chloride *slowly* into the indigo, a much smaller quantity of it is necessary to effect the discolouration than if we proceed differently. The minimum of discolouring effect, is obtained by pouring the indigo very slowly into the chloride, and the maximum by pouring the chloride very slowly into the indigo. Repeated trials have proved that the best process for obtaining constant and comparable effects, is to pour the solution of indigo *rapidly* into the solution of chloride, or the latter into the former. I shall explain the mode of operating by and bye.

If the indigo of commerce were pure, or always of the same

quality, the quantity of its solution employed in each assay would give the relative quality of the chloride; but since its quality is very variable, the results of trials made with different indigos cannot be compared together. To avoid these inconveniencies, I have followed the example of M. Welter, and taken as unity of discolouring power that of pure, dry, chlorine, at the barometrical pressure of 0·76 m. (29·92 inches,) and temperature of 0°. (32 Fahr.) I prepare a solution of any of the best indigos of commerce of such a strength that the chlorine discolours exactly ten times its volume of it, and I call this solution the *proof tincture*; and each volume of proof tincture that is discoloured I call a *degree*, and I divide the degree into ten parts.

Thus, if we take 10 grammes* of chloride of lime and dissolve it in such a quantity of water as to form one litre of solution, the number of degrees, or volumes of indigo discoloured by one volume of the solution of chloride, will indicate the number of tenths of a litre of chlorine that the solution contains. Consequently, one kilogramme† of chloride of lime, whose quality had been determined by this method, and found to be of 7·6° or $\frac{76}{100}$ths, would contain 76 litres of chlorine. Each degree therefore is equal to 10 litres, per kilogramme of chloride, and each tenth of a degree to one litre. Supposing the sub-chloride of lime to be perfectly pure, and formed as stated by M. Welter, it contains per kilogramme 101·21 litres of chlorine.

The base I have adopted appears to deserve the preference, from the simplicity and precision of expression that it admits of in chlorometry, which may remain unchanged, whatever means may be used to measure the strength of the chlorine.

We obtain more precision in general with a weak solution of chloride, marking for instance 4 or 5 degrees, than with a very concentrated solution. If, therefore, on the first trial we find that the chloride much exceeds 10°, we must add a known volume of water to the solution, for instance, twice its bulk; we then make a fresh trial, and triple the number of degrees obtained to get the true value of the chloride.

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* Or one decagramme, Tr. † Or 100 decagrammes Tr.

Assay of the Oxide of Manganese.

The purity of the oxides of manganese, employed in preparing the chlorine, is very variable, and consequently that of any particular ore must be ascertained by experiment, which may be easily done in the following manner.

Pure peroxide of manganese is formed of,

Manganese	3·5578 grammes
Oxygen	2·0000
	5·5578

and furnishes 4·4265 gram. of chlorine, or 1·3963 litre, at the temperature of 0°, and under a pressure of 0·76 m.; consequently 3·980 gram. would produce one litre of chlorine, and one kilogramme would produce 251·23 litres.

We take, therefore, 3·98 gram. of the oxide of manganese which we wish to assay, and treat it with muriatic acid, with a gentle heat, receiving the disengaged chlorine in rather less than a litre of milk and lime; towards the end of the operation we make the acid boil, to drive the chlorine from the vessels into the milk of lime, and add water to make its quantity just one litre. The quality of this chloride will exactly give that of the oxide of manganese.

The value of the manganese does not depend wholly on the quantity of chlorine it is capable of furnishing, but also on that of the muriatic acid required for its production. But the operation is delicate, and the low price of muriatic acid makes it unnecessary. I shall only remark, that the peroxide of manganese often contains the carbonates of lime, barytes, and iron, which saturate to mere loss a portion of the muriatic acid ; moreover, as the manganese is not always in the sate of peroxide, the quantity of muriatic acid required will not in that case be proportionate to that of the chlorine obtained.

PART II.

Description of the Chlorometer, and of the Method of proceeding in the Assay of the Chloride of Lime. (See the Plate.)

A small balance, a weight of 5 grammes, and a mortar, contained in M. Gay-Lussac's plate, are omitted, as sufficiently intelligible without engraving.

The mortar is to pulverize the chloride of lime; by this operation we ensure greater accuracy in the assay, as the chloride often contains lumps which dissolve slowly.

D. Jar, with a foot, containing exactly half a litre when filled to the circular line *m*, terminated by two opposite arrows; the *surface* of the water must coincide with this line, and not its upper edge, which is indicated in the figure by the dotted line.

The jar must be placed on a horizontal table.

E. Stirrer, to stir the solution of the chloride and make it homogeneous: it is to be plunged down into the liquor, and raised up again alternately, without being taken out of it.

F. Small measure, or tube, of 2½ cubic centimetres, which is unvarying for the chlorometer in question; it is intended to measure the solution of chloride of lime. To fill this tube, it is plunged into the chloride to just above the circular line *n*, which terminates its capacity, and the chloride made to rise in it by suction; when filled, the fore finger, which should neither be too dry nor too wet, is placed on the upper orifice, the tube raised out of the liquid, and its lower extremity supported against the margin of the jar, as seen at G, or against the finger. By a little management of the pressure, and a slight alternate circular motion of the stem between the fingers, the liquid descends slowly, and when the lower part of the concave curve which terminates it is in the plane of the little circular line, the stream is immediately stopped by increasing the pressure and the tube emptied into the drinking glass H.*

H. Large drinking glass for mixing the indigo proof tincture

* When the tube becomes opaque, it is cleared by dipping it into muriatic acid, or vinegar.

with the chloride. It should be placed on a sheet of white paper, in order more easily to observe the changes of colour which the indigo undergoes by the action of the chlorine.

I. Tube for measuring the proof tincture: each great division, or degree, is equal to the capacity of the small tube F, and is divided in 5 parts, which is sufficient for practice; but for calculation, the fifths are reduced to tenths. This tube is filled with the proof tincture up to the degree 0, which is easily accomplished, by putting into it rather more tincture than is necessary, and pouring off the excess, drop by drop, by the beak, the extremity of which should be covered by a slight layer of wax or tallow, to assist the running off in drops.

K. Another tube graduated like I, but in a contrary direction. Its use is to hold the proof tincture which is to be poured briskly into the chloride. For conveniently obtaining the desired volume of the tincture, the tube L, drawn out to a point at its lower end, is employed; the excess of tincture is removed by plunging the tube to the necessary depth into it, and closing the upper orifice with the finger before it is withdrawn; in the same manner a deficiency may be supplied from the vessel containing the indigo.

Preparation of the Solution of Indigo, and of the Proof Tincture with that Solution.

"Take a determinate quantity of indigo, sifted through a silk sieve, put it in a mattrass with nine times its weight of concentrated sulphuric acid, and heat it in a water bath, at the temperature of boiling water, for six or eight hours. Dilute a part of this solution with such a quantity of water that one volume of chlorine may discharge the colour of exactly ten volumes of the solution: this will be the proof tincture. The simplest, and at the same time sufficiently accurate method of preparing a liquid containing its own volume of chlorine, is to take 3·98 gram. of well crystallized manganese, and treat it with muriatic acid, receiving the chlorine in milk of lime, whose volume is to be reduced to that of one litre after the operation, as mentioned in the assay of the oxides of manganese; but if we wish to operate with the utmost accuracy, the chlorine must be prepared in the state of gas, and absorbed by

water in which a little lime has been infused; the temperature, pressure, and moisture of the gas being noted.

Important Observation.

"The proof tincture, being gradually discoloured by light, must be carefully kept secluded from it in stone jars; but for the use of the chlorometer it may be preserved in a half litre glass phial, always taking care not to expose it to the direct rays of the sun: it had better be kept in a dark closet.

Process of Assaying the Chloride.

"Take several specimens from the mass of chloride to be examined, and weigh off 5 grammes, and pound them in the mortar with a sufficient quantity of water to make thin cream; then dilute it with more water, and decant it into the half litre jar. In order not to lose any liquid in this operation, rest the edge of the mortar against the pestle, as seen in the figure D. Triturate the residual chloride remaining in the mortar with water, and decant as before, and repeat these operations till no more is left in the mortar. Rince it out and pour the rincings into the jar. Make up the volume to exactly half a litre, and stir it to render it perfectly homogenous. Fill the tube I, with proof tincture up to 0°, and pour a portion of it, less than that which you suppose will be discoloured by the chloride, into the glass H, for instance, 5°.

Take one measure of chloride in the small tube F, and make it flow equally into the proof tincture, by blowing into the tube agitating the mixture the whole time. If the tincture be completely discoloured, add quickly from the tube I, such a further quantity as to give the liquid a slightly greenish colour; the quantity of proof tincture taken from the tube I, will be the measure of the quality of the chloride, provided the second portion added be not considerable, nor amount to three-tenths of a degree.

But if the second portion of proof tincture added to the chloride exceed the quantity of three-tenths of a degree; if, for instance, it it amount io 1.2°, the assay must be begun again. Fill the tube I

with the tincture, and pour as much of it into the glass H, as is equal to the quantity discoloured in the former experiment, and some hundredths over. Then complete the operation in the manner already described. The assay has not attained the utmost precision it is capable of, till the proof tincture assumes the slightly greenish tint, *immediately* on the chloride being added, without a fresh quantity being required.

By these successive operations we approach as near as we please to the true quality of the chloride; nevertheless, I do not think that we can in general be certain of it beyond $\frac{1}{50}$th. These operations may perhaps appear complicated, but I must remark, that each of them may be executed in two or three minutes; that when we previously know pretty nearly the quality of the chloride two operations are sufficient, and that in the current labours of a manufactory, one assay will be enough. Moreover, the object is to ascertain the quality of the chloride, in order to fix its commercial value, and in that case we must not be niggard either of our time or our pains.

The same process is directly applicable to the assay of a solution of chlorine in water; but it is better to begin by adding a little powdered quick-lime to the liquid to convert it into chloride.

The tube K, which forms part of the chlorometer, is intended for assaying the chloride, by pouring the indigo quickly into the chloride. For this operation, the quantity of tincture required to saturate one measure of chloride must be previously ascertained by the tube I.

The assay is then begun again by putting into the tube K, a quantity of tincture equal to that which has been discolonred, and a small quantity over, which must be poured quickly into a fresh measure of choride; as much tincture must then be added as is necessary to give the greenish colour, and the assay once more renewed by putting into the tube a quantity of the tincture equal to that discoloured in the preceding assay. The manipulations in this experiment, are precisely the same as those of the first; but since the results are similar, and it requires the tube K. and L. in addition, I do not consider it as preferable to the former.

"It may be convenient to some of our readers, if we reduce the French weights and measures employed by M. Gay-Lussac, in the preceding very valuable paper to equivalent English ones.

100 cubic inches of pure dry chlorine, at the mean pressure and temperature of 30 inches and 60° Fahr. weigh 75.375 grains, one volume of which discolours 10 volumes of the *proof tincture*.

Suppose we take 250 grains of chloride of lime, and dissolve it in 100 cubic inches of water, and that we find the value of this solution to be denoted by 7.6°, or, in other words, that 1 cubic inch of the solution discolours 7.6 cubic inches of proof tincture; then the whole quantity, or 100 cubic inches of the solution of chloride, would discolour 760 cubic inches of tincture, one-tenth of which, or 76 cubic inches, is the quantity of chlorine it contains.

250 grains $= \frac{1}{28}$th of a pound avoirdupois; consequently, 1 lb. of chloride of lime of the above quality would afford (28 + 76) = 2128 cubic inches of chlorine, or rather less than $1\frac{1}{4}$ cubic foot, or about 138 cubic feet per cwt.

Assay of the Oxide of Manganese.

Pure peroxide of manganese is composed of

Manganese	28 grains
Oxygen	16
	44

and affords 36 grains of chlorine, or 47.76 cubic inches at mean pressure and temperature; consequently 92.127 grains will give 100 cubic inches, and 1 lb. will give 4.397 cubic feet.

We take therefore 92.127 of the oxide to be assayed, and treat it as directed, p. 141, receiving the disengaged chlorine in rather less than 100 cubic inches of milk of lime, which, after the operation, must be made exactly equal to that quantity by pure water and assayed as above. The result will indicate the quality of the oxide of manganese in cubic inches of chlorine per 92.137 grains of ore.

To coincide with these weights and measures, the small weight should be equal to 125 grains: the capacity of the jar G to the

arrows, 50 cubic inches, and that of the little measure or tube F, $\frac{2}{10}$th of a cubic inch. Each of the large divisions on the tubes I and K, must also be equal to $\frac{2}{10}$th of a cubic inch, to correspond with the capacity of the small measure F.

To prepare the liquid containing its own volume of chlorine, instead of the 3.98 grammes, &c. we must take 92.127 grains of well chrystalized oxide of manganese, and receive the chlorine in 100 cubic inches of milk of lime; and in the process of assaying the chlorides, we must employ 125 grains of the mixed salts, and decant the solutions into the 50 cubic inch jar D J. G. C."

To render this work as useful as possible, and to prevent any ambiguity respecting the French Weights and Measures, the following tables are subjoined.

English Troy Weight, with the equivalents in French Grammes.

Pound.		Ounces.		Drms.		Scruples.		Grains.		French Grammes.
1	=	12	=	96	=	288	=	5760	=	372,96
		1	=	8	=	24	=	480	=	31,08
				1	=	3	=	60	=	3,885
						1	=	20	=	1,295
									1 =	0,06475

French Measures of Capacity, with the equivalents in cubic inches, and English Measures.

		Cubic Inches.		English.			
Millilitre	=	,06103					
Centilitre	=	,61028					
Decilitre	=	6,10280		Tons.	Hogs.	Wine G.	Pints.
Litre	=	61,02800	=	0	0	0,	2,1133
Decalitre	=	610,28000	=	0	0	2,	5,1352
Hcatolitre	=	6102,80000	=	0	0	26,419	
Kilolitre	=	61028,00000	=	1	0	12,19	
Myriolitre	=	610280,00000	=	10	1	58,9	

French Measures of Weight, with the equivalents in Engl Grains and in Avoirdupois.

		English Grains.		Avoirdupois.		
				Poun.	Oun.	Dram
Milligramme	=	,0154				
Centigramme	=	,1544				
Decigramme	=	1,5444				
Gramme	=	15,4440				
Decagramme	=	154,4402	=	0	0	5,65
Hecatogramme	=	1544,4023	=	0	3	8,5
Kilogramme	=	15444,0234	=	2	3	5
Myriogramme	=	154440,2344	=	22	1	2

INDEX.

FINIS.

PLUMMER AND BREWIS, PRINTERS, LOVE LANE, EASTCHEAP.

arrows, 50 cubic inches, and that of the little measure or tube F, $\frac{2}{10}$th of a cubic inch. Each of the large divisions on the tubes I and K, must also be equal to $\frac{2}{10}$th of a cubic inch, to correspond with the capacity of the small measure F.

To prepare the liquid containing its own volume of chlorine, instead of the 3.98 grammes, &c. we must take 92.127 grains of well chrystalized oxide of manganese, and receive the chlorine in 100 cubic inches of milk of lime; and in the process of assaying the chlorides, we must employ 125 grains of the mixed salts, and decant the solutions into the 50 cubic inch jar D J. G. C."

To render this work as useful as possible, and to prevent any ambiguity respecting the French Weights and Measures, the following tables are subjoined.

English Troy Weight, with the equivalents in French Grammes.

Pound.		Ounces.		Drms.		Scruples.		Grains.		French Grammes.
1	=	12	=	96	=	288	=	5760	=	372,96
		1	=	8	=	24	=	480	=	31,08
				1	=	3	=	60	=	3,885
						1	=	20	=	1,295
									1 =	0,06475

French Measures of Capacity, with the equivalents in cubic inches, and English Measures.

		Cubic Inches.		English.			
				Tons.	Hogs.	Wine G.	Pints.
Millilitre	=	,06103					
Centilitre	=	,61028					
Decilitre	=	6,10280					
Litre	=	61,02800	=	0	0	0,	2,1133
Decalitre	=	610,28000	=	0	0	2,	5,1352
Hcatolitre	=	6102,80000	=	0	0	26,419	
Kilolitre	=	61028,00000	=	1	0	12,19	
Myriolitre	=	610280,00000	=	10	1	58,9	